

HORTICULTURAL ABSTRACTS.

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Horticultural Abstracts

Vol. I

September, 1931

No. 3

HORTICULTURE—MISCELLANEOUS.

220. **Cameron Brown, C.A.**

631.588.1:634/5

The use of electricity in horticulture.

J. Min. Agr., 1931, 38 : 132-7, bibl. 4.

A summary from an economic standpoint of the present position of research and the applicability of results to British conditions. The author shows that the use of electric power for ploughing, cultivating etc., is up to the present prohibited by the high capital outlay necessary. He cites the case of the Petit Treuil de Labourage Electrique S.G.A. and of the Electro-Jardinier Rigondeau, though he notes that no figures or costs are actually available regarding the latter. Again he does not consider that research results to date justify the economic use of electric light for stimulating plant growth. But he does, however, think that a good case is already made out for the use of electricity as a source of bottom heat. Examples are given of its successful application in Scandinavia and Northern Germany, the cost per kWh in Germany being 0.72d. He considers that "a successful demonstration of the system in this country might lead not merely to the fitting of electrical apparatus to existing frames and hot beds, but to the expansion of the industry freed from the obvious drawbacks of manure hot beds."

221. **Vogel, F.**

581.08:631.346

Zur Technik der Anstellung von Gefäßvegetationsversuchen im Gartenbau.

(The installation of apparatus for pot experiments in horticulture.)

Gartenbauwissenschaft, 1929, 2 : 351-64, bibl. 7, and 1931, 5 : 35-47, bibl. 2.

The author describes with very clear and informative photographs and diagrams drawn to scale two types of installation erected at Weißenstephan. In the first article an account is given of apparatus specially suited for high growing nursery plants, in the second of apparatus rather differently disposed suitable for similar plants, as also for plants of more spreading habit. In the second improved type of apparatus it is not only possible to widen the distance between the two rows of pots, which are mounted on frames running along lines, but also to alter the position of the pots by a process of shunting without removal of pots from the frame, which enables the plants under investigation to be subjected to uniform environmental conditions. Such an installation has been in use for fertilizer experiments with currants, gooseberries, roses, lilac and vegetables for the last two years at Weißenstephan.

TREE FRUITS, DECIDUOUS.

(See also under STORAGE.)

Selection.

222. **Wenholz, H.** 634.1/8-1.523(94.4)
Plant breeding in New South Wales. Fourth year of progress.
New South Wales Dept. Agr. Sci. bull. 36, 1931, pp. 46.
A report on the work done in the State during the period 1929-30. Details are included of results to date and work proposed for the future on apples, pears, peaches, plums and prunes, apricots, cherries, citrus and grape vines.
223. **Rudloff, C. F.** 634.1/7-1.523(43)
Einiges über die Obstzüchtung in Deutschland. (Fruit breeding work in Germany.)
Züchter, 1931, 3: 197-204, bibl. 10.
The author reviews shortly the history of fruit breeding in Germany. He then states the present aims of the Kaiser Wilhelm Institute for Breeding Experiments at Müncheberg as follows:—
1. The quickest possible creation of unlimited material for selection by sowing seed from valuable fruit varieties allowed to flower normally and from specific crosses. 2. Standardized selection with definite aims in view from among the unlimited F1 generation and continuance of the work by hastening successive generations by technical methods. 3. Crossing species and varieties to achieve resistance and produce new kinds of fruit. He notes a continuance of Baur's work on gooseberry breeding for types resistant to mildew, breeding against *Didymella* and the introduction of new *Rubus* types by blackberry × raspberry crosses. Some idea of the scale of the work can be got from his statement that in the last 3 years some 40,000 artificial pollinations have been done on the flowers of fruit trees. Similar attention has been paid to bush fruit and there are now available under observation 50,000 fruit bushes and 20,000 fruit tree seedlings resulting from such crosses. Again, close on 200 cherry hybrids are flowering for the first time this year, when they will be tested for self fertility.
224. **Shaw, J. K. and French, A. P.** 634.11-1.521
The identification of apple varieties from non-bearing trees.
Massachusetts Agr. Exp. Sta. bull. 274, 1931, pp. 58-87, bibl. 29.
The authors note the type of characters which distinguish North American apple varieties in form of growth, in bark colour, i.e. that of the older bark and of the bark of the one-year shoots below the growing tips, in shoot growth, e.g. zigzag or straight, direction of successive internodes etc., in leaf bud appearance, in wood hardness, in lenticels. They then consider in rather more detail the leaf characters as seen in the *single leaves coming out on the current season's growth*, recommending specially for comparative study the *well-developed, uninjured leaves usually found along the middle of the season's growth*. Points to be noted in the leaf are the petiole, and of the leaf itself the size—outline—tip—folding—serrations—texture—pubescence—surface—thickness—colour. They then consider common impurities in nursery stocks of McIntosh—Gravenstein, Baldwin, Duchess, Winter Banana, Rambo, the Winesap group and the McIntosh group, giving aids to identification by leaf characters. The bulletin is in continuation of bulletin 208 of the Massachusetts Station, forming part of the Annual Report for 1922. [It may be noted that methods of distinguishing different Paradise apple stocks in this way were described by Hatton in the *J. Roy. Hort. Soc.* XLIII and XLIV.—Ed.]
225. **Kimball, D. A. and Dickson, J. H.** 634.13(71.3)
The pear in Ontario.
Ontario Dept. Agr. bull. 354, 1930, pp. 39.
The prevalence of pear *Psylla* and blight, *B. amylovorus*, has led to decreased plantings. The authors discuss the measures necessary for overcoming such difficulties and give details of some

8 varieties suitable for planting in the Niagara district. They consider that work is needed on the rootstock question. The most usual stock at present is French seedling, *P. communis*, which suffers badly from blight.

Propagation.

226. **Tukey, H. B. and Brase, K.** 631.534:634.11 + 634.14

Granulated peat moss in field propagation of apple and quince stocks.

Proc. Amer. Soc. Hort. Sci., 1930, 27 : 106-8, bibl. 1.

Granulated peat moss obtained from Germany was tested at Geneva, N.Y., in an attempt to obtain better rooting of apple and quince layers on heavy soil. In the case of apple stocks (Malling Types I, XII, XIII), the peat moss, dampened, was used to cover the pegged down layers. The quinces were treated by mound layering. In their case the peat moss was incorporated in the soil and earthed up around them as they grew. The percentage of well rooted plants was higher where peat moss was used, and the general quality of the plants was much better. Types of vegetative stocks that root easily are less benefited by peat than those which root with more difficulty.

227. **Upshall, W. H.** 634.23-1.543

Some experiments in transplanting sweet cherry trees.

Proc. Amer. Soc. Hort. Sci., 1930, 27 : 259-64.

A series of experiments were started in the autumn of 1927 and are still continuing, to determine the effect of time of planting and pruning treatment on stand and growth in the Niagara district of Ontario. Two-year-old trees on Mahaleb stock were used, the scion varieties being Double Flowering Cherry and Windsor. The treatments were: (1) Spring planted, unpruned; (2) Spring planted, lightly pruned; (3) Spring planted, heavily pruned; (4) Autumn planted, heavily pruned in spring; (5) Autumn planted, lightly pruned in spring; (6) Autumn planted, unpruned; (7) Autumn planted lightly pruned in autumn; (8) Autumn planted, heavily pruned in autumn. In lightly pruned trees all branches were pruned back one-third; heavily pruned trees were cut back to 2 or 3 buds, and the leader pruned to one half the length. Combining 3 years' figures of pruning, growth differences are not statistically significant but favour light pruning over heavy pruning and pruning over no pruning.

The differences between autumn and spring planting are not conclusive, though there is a bias towards autumn. The 1929-30 experiment autumn planted trees, pruned either lightly or heavily, endured the winter with little loss, while the unpruned autumn planted trees almost all perished. The system of digging trees in the autumn and storing them, i.e. heeling in in moist earth in a good nursery storehouse over winter, was found to result in more deaths than either spring or autumn planting.

228. **Bijhouwer, A. P. C.** 575.7

Old and new standpoints on senile degeneration.

J. Pom. Hort. Sci., 1931, 9 : 122-44, bibl. 72.

In view of the present widespread interest in vegetative propagation, the review given by the author of the theory of senile degeneration in the plant world is of exceptional interest. He shows that opinion still remains divided regarding the necessity of occasional sexual propagation to prevent degeneration. He considers that certain instances such as that of the Magnum Bonum potato tend to prove the contrary, while others cited by supporters of the "senility" theory are not yet proved, e.g. *Elodea*. He notes that usually, when this theory has been advanced, later knowledge has proved disease to be the real cause of the so-called "degeneration," e.g. the grape vine and *Oidium*; *Peronospora* and *Phylloxera*, the elm and *Graphium ulmi*. He considers that in any further examination of the subject the methods and basis of both venation and cell size will need investigation, and that more exact mathematical methods will have to be used to reach definite conclusions. The bibliography adds considerably to the value.

Rootstocks.*

- 229.
- Childs, L. and Brown, G. G.**

634.1/2-2.11

A study of tree stocks in relation to winter injury and its prevention.

Oregon State Agr. Coll. Agr. Exp. Sta. circ. 103, 1931, pp. 15.

A study of over 5,000 pear trees in 164 plantings showed that Comice, Easter and Flemish Beauty pears were much less injured on the south side of the trunk than d'Anjou, Bosc, Bartlett and Winter Nelis. Newtown, Spitzenburg, Ortley, Jonathan and Winter Banana suffered much more than Astrachan, Arkansas, McIntosh, Ben Davis, Delicious, as a result of freezing damage. Protection from the winter sun was found efficacious with susceptible varieties. White water paint and board shields lessened trunk damage on pears of 1-10 years old. Pears on Japanese stock were found more susceptible than those on French seedling. Experiments are in progress to try the effect of 78 apple varieties and 43 pears, supposedly winter hardy, as intermediate stocks. Astrachan has been found to be highly resistant to woolly aphids.

- 230.
- Roberts, R. H.**

634.11-1.541.11/12

Two more seasons' notes upon stock and scion relations.

Proc. Amer. Soc. Hort. Sci., 1930, 27 : 102-5, bibl. 3.

Work of 1929 and 1930 furnishes data upon stock and scion relations which extend and generally corroborate previously reported findings [which have, incidentally, always been made on trees of not more than 3 years' growth.—ED.] Stocks from a single clone have a "very unequal effect" upon different varieties. The influence of Malling Types IX and XII upon Whitney and York double worked on them is cited in support. Here Whitney on Type IX averaged 15.8 cm. growth as against York 45.1 cm. for 3 years. Growth on Type XII averaged 32.2 for Whitney and 42.8 for York over the same period. The fact that the effects of double working upon root type varied with the intermediate stock piece led to a classification into dominant, medium and neutral stocks, dominant being one which prevented the new scion variety from modifying the type of root growth, while neutral would permit such a change. Scion influence also appears to be affected by seasonal conditions. A better stand of and growth of grafts was secured by cutting the scion so that the top bud was in vertical line with the point of union. Grafting upon the stem of the seedling instead of directly upon the root gave trees with variable root systems as contrasted with the uniform types produced from root grafts.

Growth, Nutrition, etc.

- 231.
- Schindler, O.**

634.1/2-1.585

Obstbäume und Rasen. (Fruit trees and grass.)

Obst. u. Gemüsebau, 1931, 77 : 58-9.

Four specimens were taken from one Doucin apple clone, being of like weight and growth, and were planted in two root boxes. The surface of the first root box was formed by meadow turves, the second kept without grass. On one half only of the grassed box the grass was cut to a length of 5 cm. on May 14th and June 26th. The author shows with photos (1) the difference in growth between the grassed and ungrassed plants, the average increases per plant being 11 cm. in the grassed and 36 cm. in the ungrassed boxes. In the latter the leaves also were larger and did not fall so soon; (2) the effect of cutting the grass on the grass roots, which was considerable. An examination on the 15th October showed that the roots of the cut grass were 60 cm., those of the uncut some 130 cm. long.

* See also, 265, 287.

232. **Wicks, H. N.** 634.11-1.55

The problem of the "off" year in apple cultivation.

Fruit World of Australasia, 1931, 32 : 213-5.

Nitrogenous manures applied in autumn to apple trees of pronounced biennial bearing proclivities have apparently resulted in those trees producing quite fair crops during the years in which, normally, they would have carried little or no fruit. The observations cover a period of four years. A suggestion is made that special research on these lines should be inaugurated, since the "off" year is one of the most serious hindrances to profitable orcharding.

233. **Carne, W. M.** 634.11-1.55

Heavy and light cropping in alternate years. A serious defect of the Australian apple industry.

J. of Council Sci. and Ind. Res. Australia, 1931, 4 : 65-77, bibl. 7.

Biennial bearing is not unusual in other apple growing countries to the extent of 15 to 20 per cent. above and below the mean, but in Australia the fluctuation may be as much as 70 per cent., with the result that a season of glut, which floods the markets and results in unremunerative prices, is succeeded by a season of scarcity, when the crop is not sufficient to pay for the losses incurred the previous year. Discussing the cause of this alternate cropping, which is invariably set up when orchards arrive at full-bearing, the author suggests that some thing, such as an infestation of thrips, disturbs the physiological balance by preventing the normal setting in one year. The next year the trees bear a bumper crop owing to the fact that the nitrogen supplies, which would have gone to the missing flowers and young fruit, become available for vegetative growth. This develops in excess of the normal and provides an accumulation of carbohydrates in excess of nitrogen, a state favourable to fruit bud formation. The subsequent heavy bearing depletes the carbohydrates while drawing relatively less on the nitrogen, and leaves a condition favourable to leaf bud rather than fruit bud formation. In the following spring the trees have relatively few fruit buds and a relatively low carbohydrate nitrogen ratio, consequently the crop is small and the vegetative growth strong, and so the fluctuation thus started goes on. Methods suggested for upsetting the fluctuation are the prevention of very heavy setting, possibly by means of a spray which will destroy the flower buds without damaging the tree, or by supplying the tree with sufficient available nitrogen to balance the excess carbohydrates. The author considers that the most desirable cropping system would be one whereby approximately one half the trees of each variety in each State were in heavy bearing in alternate years. The light fruit crop which would be poor in keeping quality would go to the home markets, while the heavy crop would be exported. It is recommended that a start should be made with 10 per cent. of the trees to bring about this system in New South Wales, Tasmania, Victoria and South Australia; if successful it could be extended more rapidly. Western Australia is excluded, as the existing conditions there are already favourable to growers.

234. **Watanabe, R. and Yasaka, T.** 634.11-1.547.4/5

Studies on the time of fruit bud formation and development of apples in Manchuria. [Japanese-English summary.]

South Manchuria Railway Co. Agr. Exp. Sta. Res. bull. 1, 1930, pp. 1-30.

The apples examined were Red Astrachan, Summer Pearmain, Jonathan, Ben Davis, Ralls Janet, Tetofski. In 1928 and 1929 fruit buds of the apple differentiated between June 25th and July 10th in Yugakujyo, latitude 40° Manchuria. The primordia of the floral organs appeared from the middle to the end of July. There was about two weeks' difference in the time of the formation of the fruit bud between the early and late varieties; no early stages of differentiation were found later than the end of July, and the authors do not believe that the period is prolonged until the frost. The shoot growth proceeds in two "waves" with a rest period corresponding to the period of fruit bud differentiation. During the rest from elongation the shoots develop in thickness. The fruit bud differentiation period for Manchuria resembles that of Oregon.

235. **Borysook, N. A.**

634.1/2:581.11

Materials relating to the transpiration of fruit trees. [Ukrainian-12 p. English summary.]

Mleev Hort. Exp. Sta. Pom. Sect. bull. 41, 1931, pp. 127, bibl. 38.

The rate of transpiration in apple, pear and plum trees is studied in detail. In apples and pears the rate decreased from the apex to the base of the tree and from the periphery to the centre, the difference between maximum and minimum rates being largely dependent on the density of the head. Shoots transpired more than spurs. The rate of transpiration seemed to be influenced both by scion variety and by rootstock. Transpiration and loss of reserve water were greater in a variety worked on French crab than in the same variety worked on Doucin. The water content of the leaf "lamel" [blade ?—Ed.] was greater on the latter stock. No such differences were apparent between trees worked respectively on Doucin and on Siberian crab. [Apparently comparisons between the various types of Paradise stock were not made.—Ed.] Worked on French crab some varieties lost their reserve water 4-5 times as fast as others, whereas on Doucin varietal differences were not so marked. In general, though there are some exceptions, strongly transpiring varieties lose their reserve water quickly, feebly transpiring varieties slowly. On a given stock (Doucín or French crab) the actual water content of the leaves did not vary more than 5 per cent. as between varieties. In all apples the rate of transpiration was found to be less than that of evaporation from a free water surface. Pears worked on quince transpired less than those on *Pyrus communis*. [The same variety, however, was not used in the two cases.—Ed.] The direct interdependence of the ripening period of fruits and the intensity of transpiration of different varieties of pears has been noticed, though no such dependence has been observed in apples. Early varieties transpired much more strongly than late varieties, except one winter variety, Josephine Malines and *Pyrus communis*, which showed a high instead of a low rate. Experiments on plums showed marked varietal differences in transpiration rates, there being also some indication that early ripening transpire less than late ripening varieties. In general apples transpired most, pears being intermediate and plums transpiring least. In "spending of water reserve" apples were again first, the pear being second and the plum the most economical. The plum had the highest water reserve. No parallelism was found between drought resistance and transpiration rates. Hence, to know a variety's drought resistance it is essential to know also "the degree of development of the root system and the above ground part of the plant, its anatomical structure and the physiological characteristics of its leaves, its capacity for assimilation, transpiration, the conductivity of its tissues, and its ability for enduring permanent wilting." He concludes that the study of soil moisture and of the drought resistance of plants "are of a greater importance for horticultural practice than the mere study of transpiration."

236. **Harvey, E. M.**

581.112:631.541/2

A method for studying water conduction in plants in relation to pruning, grafting and other horticultural practices.

Oregon State Agr. Coll. Agr. Exp. Sta. bull. 279, 1931, pp. 26, bibl. 3.

The author describes a suction method for the introduction of dyes into plant tissues, claiming only to facilitate the working of methods already known. Branches with a diameter not more than 7 cm. are connected with the source of suction by means of a one-hole rubber stopper of the same diameter. A branch 7 cm. in diameter is then connected by a No. 13 rubber stopper, if its larger diameter is placed next to the base of the branch. The surface of the stopper should be against the surface of the branch, but numerous intersecting grooves should be cut into the contact surface of the rubber stopper, in order to permit equal distribution of negative tension to all parts of the base. A section of rubber tubing approx. the diameter of the branch and stopper makes the connection air tight. For branches with larger diameters flower pots may be used instead of rubber stoppers and motor inner tubes for rubber tubing. The pots should be paraffined and the drainage opening may need enlarging. Provision must be made for excluding air bubbles. All dyes must be of an acid reaction, as basic dyes will not

penetrate xylem tissue satisfactorily. The writer considered his best dyes for tracing water conduction to be aniline blue, amaranth, acid or light green, acid fuchsin, trypan blue, methyl blue, eosin, tartrazine (and most of the yellow dyes) and ponceau red. He shows how by his method water conduction can very easily be studied in the case of normal, uninjured branches, how the effects of pruning wounds, of the removal of scaffold branches may be gauged. The influence of the type of crotch, the effects of cankers, gummosis and mechanical injury, the path of water conduction in 1-4 year old branches, the effects of water-shoots may all be determined thus, while the vascular elements available to a newly grafted scion are equally well demonstrated. It may also be applied to the study of phyllotaxy. It has been used successfully with herbaceous plants, such as strawberries.

237. **Magness, J. R. and Furr, J. R.** 634.11:581.12
Stomatal activity in apple leaves.
Proc. Amer. Soc. Hort. Sci., 1930, 27 : 207-11, bibl. 4.

By the aid of a portable microscope magnifying at least 200 times fifty stomata can be examined and recorded in the field in two minutes, including stripping the lower epidermis and mounting on a dry slide under a cover glass. The width of the stomatic opening is recorded in tenths of the fully opened condition, completely closed being designated zero. There is no tendency for the stripped stomata to close, and the results of this method have been found to agree with the results of the much slower method of direct observation. The data obtained during this investigation show that the time of closure of stomata in bearing apple trees is determined in large part by the evaporating power of the air and the moisture supply to the tree. With ample soil moisture the stomata remained open even under conditions of excessive evaporation. The time of closing of the stomata became progressively earlier in the day, as moisture in the soil decreased below the wilting coefficient. It seems probable that a study of the comparative stomatal behaviour will provide the most ready means of determining whether or not a plant is getting the water it needs for optimum growth.

238. **Furr, J. R. and Magness, J. R.** 634.11-1.432.2-1.547
Preliminary report on relation of soil moisture to stomatal activity and fruit growth of apples.
Proc. Amer. Soc. Hort. Sci., 1930, 27 : 212-8, bibl. 3.

The investigations were conducted on apple trees Rome Beauty and Duchess of Oldenburg, 20 years old, growing in well drained, well aerated soil and regularly bearing heavy crops, the varieties being planted alternately in the rows. The trees were divided into six plots, of which two were disced and seeded to alfalfa, two were disced and given one cultivation in June, two received a heavy straw mulch in June. One plot of each treatment subsequently received only the natural rainfall, the other plots received irrigations by the sprinkler system every two weeks from May to October. At the end of the growing season the average size of the Rome fruit from the dry plots was considerably less than that from the irrigated plots. (In Oldenburg the differences were less marked because of the much earlier harvest of this variety.) The size of leaves and buds, the thickness of spurs and shoots were all much greater on the irrigated than on the dry plots, though there was less marked influence on terminal growth, which had been completed before lack of moisture affected the dry plots. The investigations seem to indicate that so long as the moisture content of the whole root zone is appreciably above wilting percentage, apple trees can function at the maximum rate. As the zones of greatest root concentration reach the wilting percentage, the tree adjusts itself to the reduced water supply by closing its stomata earlier each day, resulting in a reduction of carbon dioxide entrance to the leaf and a reduction in photosynthesis which is reflected in a reduced growth rate in the fruit. The more restricted the root zone and the greater the root concentration, the more pronounced the reaction of the tree is likely to be.

239. **Mulay, A. S.** 634.13:581.192

Statistical study of the total nitrogen in Bartlett pear shoots.

Plant Physiol., 1931, 6 : 333-8, bibl. 3.

There is great variation in nitrogen content between individual shoots from either the same or different trees, the differences between highest and lowest value being as much as 35 per cent. for bark and 50 per cent. for wood. The bark and the wood of the green shoots are lower in their total nitrogen content than that from brown shoots. This seems to indicate that the differences in the physiological conditions of the shoots may in part explain the variations in their total nitrogen content. A sample of 35-40 shoots is required to ensure the odds of 142 to 1 that the true value lies within 5 per cent. of the observed value.

240. **Potter, G. F. and Phillips, T. G.** 634.11:581.145:581.192

Composition and fruit bud formation in non-bearing spurs of the Baldwin apple.

New Hampshire Agr. Exp. Sta. Tech. bull. 42, 1930; pp. 43, bibl. 44.

The composition in July and August of the new growth of non-bearing fruit spurs was determined in 26 plots of 30-45 year old Baldwins growing under different cultural conditions. The proportion of spurs, similar to those analysed, which formed fruit buds, was determined in the following spring. The spur condition most consistently associated with blossom formation was insoluble nitrogen. There were indications that the accumulation of soluble carbohydrates, such as reducing sugars, depresses fruit bud formation. Carbohydrate-nitrogen ratios showed as close relations to fruit bud formation as nitrogen, but not significantly closer. The accumulation of carbohydrates such as starch prior to July or during the period between samples was not an indication of conditions favourable to blossom formation. The authors comment as follows : . . . since in defoliation and shading low carbohydrate content is associated with low bloom and in ringing high carbohydrate without increased nitrogen with a high bloom, there is apparently a discrepancy between such results and the findings of this paper. This may be due to (a) differences in absolute amount of nitrogen per spur or in the proportion of soluble to insoluble nitrogen not indicated by data on composition now available, (b) the increase or decrease of certain constituents to such an extent that their linear relation to fruit bud formation as determined from mature trees under field conditions no longer holds. [Kobel in his textbook successfully reconciles their findings and those on which such practices as ringing are based. H.A., I, No. 317.—ED.]

241. **Murneek, A. E.** 634.11:581.192

Quantitative distribution and seasonal fluctuation of nitrogen in apple trees.

Proc. Amer. Soc. Hort. Sci., 1931, 27 : 228-31.

The variation in nitrogen content as also in type of nitrogen, whether soluble or insoluble, of different parts of the tree at different seasons and in accordance with the demands of fruit formation etc. are noted and their results discussed. Thus during certain flowering and fruiting periods immense quantities of nitrogen are needed for the development of the various tissues associated with sexual reproduction. In a season's heavy bearing the competition for nitrogen among the young fruits is very acute, and the consequent shortage may be considered as one of the reasons for the periodic shedding of immature fruit.

242. **Markley, K. S. and Sando, C. E.** 634.11:581.113

Permeability of the skin of apples as measured by evaporation loss.

Plant Physiol., 1931, 6 : 541-7, bibl. 6.

In these investigations determinations were made of evaporation losses from normal fruit and for fruit in which the stem and calyx ends were blocked by paraffin, on 16 varieties of apples, 11 of which were duplicated from two different localities. The results of these experiments provide quantitative information upon the varietal differences with respect to the total evaporation loss from the whole apple surface and from the skin exclusive of stem and calyx opening.

Previous workers except Heinicke,* who only used one variety, failed to calculate their data on an area basis or to take into account the loss through the stem and calyx ends. Tables are given showing the total loss in 9 days and 16 days and the average daily loss per 100,000 sq. mm. for the same periods of each variety. The New York apples had a higher water loss measured thus than Washington fruit of the same variety. The stem and calyx end losses varied from 0 to 31 per cent. in different varieties and the variation was almost as great for the same varieties in different localities as for different varieties in the same localities.

243. **Smith, Laura L. W. and Smith, Ora** 634/5:581.035.3:547.979.8
Light and the carotinoid content of certain fruits and vegetables.
Plant Physiol., 1931, 6 : 265-75, bibl. 19.

A new method is described for the extraction of the carotinoid pigments from fresh tissue, using pyridine (b.p. 112-115°C.) as a solvent. Peaches, apricots and nectarines bagged in the blossom stage and developing in total darkness did not oxidize as rapidly when exposed to the air as those developing in full light. The bagged Elberta peach developed a higher carotinoid content than the unbagged; in Humbolt nectarine and Royal apricot the reverse was true. No chlorophyll developed in tomato fruits ripening in total darkness, the fruits being white, gradually gaining colour as they matured. When ripe there was no difference in colour between the bagged and unbagged red fleshed varieties. The carotinoid content was higher in the unbagged fruits. Yellow fleshed varieties showed slight differences of colour between the flesh of bagged and unbagged, and here the carotinoid content was higher in the bagged. In all varieties except one, and here the difference was but 0.02 pH, the bagged fruit had a higher pH than the unbagged.

Pollination.

244. **Hooper, C. H.** 634.1/7:581.162.3
Insect visitors to fruit blossoms.
J. South-Eastern Agr. Coll. Wye, Kent, 1931, 28 : 211-5, bibl. 9.

The author notes the visits to fruit blossoms of nine named types of bumble bee as also of *Psithyrus barbutellus*, *Osmia nifus*. The apple sawfly (*Hoplocampa testudinea*) is another visitor. He notes the Hover or Hawk flies of the Genera *Syrphus* and *Eristalis* as good pollenizers. *Bibio marci* sometimes visits pear blossoms. Blue bottles (*Calliphora erythrocephala*) visit pear blossoms and being hairy like *Bibio* carry pollen. *Bombylius major* sometimes visits apples in sunny weather. It may carry pollen but hardly touches the flower with its body. The pear midge (*Diplosis pyrivora*) is an unwelcome visitor in contrast to *Scatophaga stercoraria* which visits pear and gooseberry blossoms in small numbers and probably helps. The tiny midges (*Sciara*) are probably of very little assistance. The object of the *Coleoptera* is mainly to eat the pollen or other parts of the flower or lay eggs in the flower, e.g. *Anthonomus pomorum* and *Byturus tomentosus*. The *Lepidoptera* are unimportant as pollenizers. Other insects found, which may help in pollination but have other less pleasing traits are: aphids, thrips, earwigs, spiders. The bee family is pre-eminent for pollination, and of these the hive bee alone is under the control of man.

Manuring.

245. **Murneek, A. E. and Gildehaus, E. J.** 581.192:631.8
Leaf diagnosis and the interpretation of fertilizer requirements of plants.
Science, 1931, 74 : 39-40, bibl. 7.

The writers criticize the findings of Lagatu and Maume, in *Ann. Sci. Agron*, 1930, 47 : 5 : 596, who enunciate the following principles as a result of ten years' work—that, when one of the major

* *Proc. Amer. Hort. Soc. Sci.*, 1929, 26 : 312-14.

elements—nitrogen, phosphorus or potassium—is omitted from a fertilizer, the other two will be absorbed proportionately more, thus leading to unbalanced nutrition, disturbed metabolism and reduced yield. The data for these statements were obtained from the grape vine and potato by the chemical analysis of leaves for N, K₂O, P₂O₅ and CaO. Working on *Pyrus malus* grown in pure quartz sand and supplied with the necessary nutrients the writers of this paper found on the contrary that the reduction or total omission of either nitrogen or potassium in no instance resulted in an increased potassium or nitrogen content, respectively, of leaves; in fact a decrease of nitrogen in the nutrient medium resulted in a decrease of potassium concentration in the leaves and decreased nitrogen concentration followed a decrease of potassium in the nutrient. The writers consider that the discrepancies may be partly accounted for by the fact that Lagatu and Maume used only the basal leaves of fruiting canes of *Vitis*, and of a tuber bearing plant like the potato. Since in the case of tomato it has been demonstrated that every one of the three elements, nitrogen, phosphorus and potassium, is removed from the lower leaves whenever a shortage of a particular element for vegetative extension or fruit development occurs, it is not difficult to see how the concentration of any two of the three major elements of soil nutrients may increase in the leaves, when one is *in minimo* for the development of other metabolically more active organs. This would be due then to unbalanced nutrition of particular organs and not to increased absorption by the plant.

246. **Irish, C. P.**

-631.433

The process of aeration and fertilization of tree roots by means of compressed air.

Proc. 5th National Shade Tree Conference, 1929, pp. 35-37.

Trees which are suffering from lack of oxygen at the roots, especially in places where cultivation of the soil is difficult, are rejuvenated by the author in the following manner. Holes are bored in the ground by means of a pneumatic drill with a 1½" auger to a depth of 12-18 inches below the surface. The holes are placed 30 in. to 4 ft. apart in a circle about the tree. A specially designed nozzle attached to the air supply is inserted in the hole and the air blown in, using a pressure of 80-100 lbs. per sq. inch. The soil is fractured for an average diameter of 10 ft., and can often be seen to lift when the air is admitted and sink when it is turned off. Following the first blowing, fertilizer is often placed in the hole and blown through by a second application of air. Clay soil is more affected than a sandy one and moist soil than very dry. The plant used is of 100 ft. capacity with 300 ft. of ¾" hose, a Y coupling and two 50 ft. leads of ½" hose with the drill on one lead and the air nozzle on the other. A two foot auger is the most suitable.

247. **Wallace, T.**

634.1/2-1.4-1.83

Chemical investigations relating to potassium deficiency of fruit trees.

J. Pom. Hort. Sci., 1931, 9: 111-21, bibl. 7.

The author has found the deficiency of potassium reflected in the leaves, bark and wood portions of branch and stem and in the pulp of deciduous fruits, and by studying the potassium status of these has been able to gauge their condition and the effects of ameliorative treatments. Soil areas conducive to potassium deficiency occur patchily in the field and may be distinguished by such symptoms as leaf scorch or chlorosis, or by chemical analysis of the trees. Although differences in susceptibility to leaf scorch of varieties and rootstocks are accompanied by differences in potassium content of the plants, these differences are too small to suggest that potassium deficiency in the field can be overcome entirely by the use of resistant materials of the nature examined. Where negligible responses were got from potash manures, the plants are shown to have failed to take in adequate amounts of potassium from the dressing applied. The author considers it probable from evidence here and in the U.S.A. that the lack of response is due to the applied potash being unable to penetrate to the root systems owing to the absorptive properties of the soils concerned.

248. **Wagner, F.**

634.13-1.8

Düngungsversuche bei Pastorenbirnen 1903-26 (Manurial trials with Vicar of Winkfield pears), being Pt. 1 of Wissenschaftliche Obstbaum-u. Beerenobstdüngungsversuche in Weißenstephan.

Arbeiten der Deutschen Landwirtschafts-Gesellschaft, Hft.377, 1931, pp. 1-78.

The trial consisted of 6 plots, each containing 5 specimens of Vicar of Winkfield pears, all from one firm, grafted 2 years previously on quince stocks. Each plot was bounded by 5 cm. thick, 1 m. deep, cement casing with bottom open, each tree being allowed 3.5 × 3.5 m. surface space. Soil and subsoil were carefully and separately mixed before filling into the cases. The 30 bush trees were planted out in 2 rows running East and West with consequent, regrettable shading of the North row.

Pear Tree Lay Out.

	16.5 m			16.5 m			16.5 m		
N	↑ 3.5 m 3.5 m S	No N.	Otherwise Double Manuring	Complete Double Manuring			No K ₂ O.	Otherwise Double Manuring	
		Complete Single Manuring N.44.5, P ₂ O ₅ 44.5, K ₂ O 133.6 lbs. per acre			Unmanured			No P ₂ O ₅ . Otherwise Double Manuring	

Lime was added from time to time, the N, K₂O and P₂O₅ being given in doses as shown but in different forms as convenient. Unfortunately the ground was initially in good heart, being a heavy loam, and growth and cropping of the trees in the first ten years were equally good on all plots. The production of foliage, wood and fruit was definitely governed by the amount of N available. It was, however, only in the last 12 years that the effect of N was very obvious. Where phosphates and potash were omitted, the crop was actually greater than in their presence, but as time went on, a relative deficiency in these nutrients was noticeable in the leaves and new wood. Nitrogen additions being the same, both foliage and fruits were richer in proteins under conditions of double manuring less P₂O₅ and double manuring less K₂O than under conditions of double complete manuring. Cropping ran parallel with girth increase, increasing until 1917 and then falling off till the end of the trial. Increased N application led to increased N content of fruits, to quickening in storage ripeness and to increased loss of weight in storage. The omission of potash caused deterioration in quality of fruits, as also did the presence of large amounts of N. On excavating 1 tree per plot in 1926, it was found that the weight of its various parts corresponded with the amounts of N added, although where P₂O₅ and K₂O had been omitted the weights were greater than under conditions of double complete manuring. By appropriate nutrition the trees could be made rather more resistant to the bad effects of *Fusicladium pirinum*. The experiments yielded, however, no conclusive data as to the effects of different manurial treatments on the outbreak of this fungus.

Cultural practices.

249. **Marshall, R. E.**

634.25-1.542

The fruiting habit of the peach as influenced by pruning practices.

Michigan State Coll. Agr. Exp. Sta. Tech. bull. 116, 1931, pp. 58, bibl. 27.

Experiments in 1924 and 1925 in an orchard of Golden Drop planted in 1921 on a rather heavy, sandy loam. Each pruning treatment involved 10 trees in duplicate plots of 5 trees each, the trees having been uniformly pruned in previous years. The treatments are termed:—Severe dormant—Unpruned—Dormant and summer thinning—Moderate thinning—Dormant and

summer pinching—Bulk pruning—Light pruning. The authors conclude that pruning methods and practices in the peach orchard can be carried out without much regard to fruit bud formation, fruiting habit or winter killing of fruit buds. The chief functions of pruning in the peach orchard would appear to be tree training and crop thinning.

250. **Waring, J. H.** 634.22-1.542.27

Residual effects of fruit thinning with the Lombard plum.

Michigan State Coll. Agr. Exp. Sta. Tech. bull. 112, 1931, pp. 36, bibl. 48.

Trials consisted in thinning 48 trees, which had been planted in 1920, to 1" or more between fruits in 1925, in 1926 thinning 41 of them to the same extent, i.e. 2.9 fruits removed to 1 fruit remaining and 7 of them more severely, i.e. 6.5 to 1 remaining. 56 trees of the same age were left unthinned as a control. In 1927 a complete crop failure occurred. In 1928 the set was heavy and no thinning was done. Results strongly indicate that thinning would result in the quicker growth of trees to large size and would form the most essential basis for regular cropping by reason of its obvious effect on fruit bud formation. Fruit thinning definitely improved the market grade of the fruit. No winter of sufficient severity occurred during the experiments to afford evidence of effects of thinning in relation to winter killing. Investigations on the chemical constituents or stored nutrients of thinned and unthinned trees did not warrant definite conclusions.

251. **Schellenberg, A.** 634.11/13-1.542.24

Das Ringeln von Birn- und Apfelbäumen. (Ringing pear and apple trees.)

Gartenbauwissenschaft, 1931, 5 : 1-34, bibl. 26.

As a result of his own experiments on some 20 pear and a few apple trees, part of whose branches were ringed and part left untreated, and of earlier work by other investigators the author urges the advantages to be got from ringing pear and apple trees. His work seems to confirm the experiments of others. He notes the possibility of a falling off of fruit in the 3rd crop after the operation of ringing, but shows that the actual cropping results obtained by him are favourable. He does not mention the effects of ringing on storage quality, which have been found to be unfavourable by such workers as Wallace. It seems also open to argument whether data on ringed and unringed branches of one and the same tree can afford conclusions applicable to ringed and unringed trees respectively.

*Plant protection.**

252. **Macoun, W. T.** 635.976

Hedges and their uses.

Dom. of Canada Dept. Agr. bull. 142 N.S., 1931, pp. 44.

Since 1889 no less than 136 species and varieties of trees and shrubs have been tested for hedge purposes at the Central Experimental Farm, Ottawa, and there are still 84 varieties available there for comparison. The usual length of the sample hedge is 50 feet, the plants being set 18 inches apart in single row. In this bulletin a short note is given on each of the 136 species and their merits and demerits explained. A classified list of the best hedges at the Ottawa Experimental Farm is given, and is followed by lists of the six best hedges growing at each of 19 branch Experimental Stations. Other sections deal with the hedge plants most suitable for foliage, bark or floral effect, for shady places, for impenetrability, for rapid screening, or for windbreaks. There are concise directions for the planting and general maintenance of hedges with subheadings on trimming, shape, width, cultivation and manuring.

* See also 229.

253. **Ext, W.** 632.111.33
Phytotoxische Versuche mit neuartigen künstlichen Nebeln, sog. Säurenebeln u. sonstigen gärtnerischen Kulturen. (Plant toxicity trials with so-called Säurenebeln [Acid mists] for frost protection.)
Angewandte Botanik, 1931, 13 : 262-90, bibl. 23.

Tests are described of a cheap preparation manufactured by the Hanseatische Apparatebau-Gesellschaft at Kiel for the making of a 60% H_2SO_4 cloud as a preventive against frost damage. An account of the apparatus used and of the effects of the cloud at different acid concentrations on different plants is given. The authors find that the respiration of plants is not affected, though a certain amount of burning is apt to occur especially with fleshy leaves of such coarse, hairy plants as *Begonia*, *Primula*, *Alnus*, *Lactuca*. Conifers are hardly affected at all. Clouds of 10-20 mg. per cu. metre are found thick enough to hinder frost for several metres around. Plants to be protected must be at least 100 m. away from the apparatus producing the mist. It was not possible to test the effect on fruit blossom formation. The authors consider that their experiments have been so successful on a small scale as to merit the trying out in spring of the apparatus on a large scale, testing different concentrations, measuring their effect on plants and value as a frost preventive under different weather conditions.

254. **Bewley, W. F.** 631.462
Practical soil sterilization with special reference to glasshouse crops.
Min. Agr. bull. 22, 1931, pp. 23, bibl. 4.

The author deals in eminently practical manner, including numerous diagrams and details as to use of apparatus, with different methods of partial sterilization of the soil known commonly as "soil sterilization." The following points must be determined before choosing a method. (1) Does the method adopted provide a uniform temperature of at least 210°F. throughout the mass in reasonable time? (2) Does it turn out the soil in a condition suitable for plant growth? (3) What is the cost of constructing and working the apparatus? The following steaming methods are described in detail:—The "Small-grid" method, the "Tray" method, the "Spike" method, all of these being applicable to large amounts of soil. Methods of steaming smaller amounts are also discussed. Advice is given as to manuring after steam treatment. Methods of baking soil are commented on and their merits considered in comparison with those of steaming. Consideration is given to the use of formaldehyde and cresylic acid for sterilization, the author noting that the difficulty in getting direct contact between chemical sterilizers and every part of the soil seriously affects their efficiency. He concludes with a dozen practical hints or warnings to the grower who intends to sterilize.

255. **Cope, J. A. and Spaeth, J. N.** 634.993:632.954
The killing of trees with sodium arsenite.
J. of Forestry, 1931, 29 : 5 : 775-83.

The results of tests with arsenite led to the following conclusions and recommendations. 1. A two pound strength of sodium arsenite (the equivalent of 2 lbs. As_2O_3 per gall.) is effective and economical in killing trees. 2. The best method of application is to introduce the poison into cuts, made with an axe or tree killing tool, as near the root collar as possible. 3. Not more than an inch of unsevered bark should be left between the edges of adjacent cuts. 4. Poisoning is most effective if done between August and December. 5. Poisoning of standing trees is more effective in killing root systems than the poisoning of stumps or stubs of trees already cut. 6. An inexpensive tree killing tool for injecting the poison is described and figured.

256. **Paille, M.** 631.537:632.954.3
Note au sujet de la destruction des mauvaises herbes. (Note on the destruction of weeds.)
Revue des Eaux et Forêts, 1931, 69 : 472-5.

Deals with the application of sodium chloride as a weed killer in nurseries. The dose is 3 gm. per litre of water per sq.m., and it can be used safely to destroy weeds among 2 year old seedling

trees, the trees being unharmed: stronger concentrations were found harmful. A solute of 2 gms. per litre and 2/3 litre per sq.m. on seed beds of pine 27 days after sowing kept down the weeds and produced better germination of the sown seeds.

257. **Bennett, J. P.**

634.1/7-2.191

The treatment of lime-induced chlorosis with iron salts.

Univ. California Agr. Exp. Sta., Berkeley, circ. 321, 1931, pp. 12, bibl. 6.

The methods described are:—(1) Spraying with ferrous sulphate. (2) Trenching and adding crushed ferrous sulphate. Application should be made in early spring just before the leaves appear. (3) Injection of solutions of iron, any soluble iron salt such as iron sulphate, iron chloride, iron nitrate etc. being used at the rate of 1 oz. per gall. of water. (4) Dry salt treatment, i.e. injection of dry iron salts. Details and tables of quantities are given. The trees already successfully treated by these methods are peaches, plums, prunes, cherries, walnuts, eucalyptus and many ornamentals. These treatments should, however, be looked on merely as temporary remedies. The permanent remedy must come through the soil and in this connection Wallace's* investigations are to be noted.

SMALL FRUITS, VINES, NUTS.

(See also under STORAGE.)

258. **Johnston, S.**

634.711.2-1.535

The value of plant and tip selection in the propagation of the black raspberry.

Michigan State Coll. Agr. Exp. Sta., Q. Bull., 1931, 13 : 195-9.

Individual records were kept on 105 Cumberland plants for 3 years, being selected from a field of over 1,000 to represent the range in vigour and productivity presented by the entire population. Only plants free from disease were used. Tips were rooted from low and high producing individuals, graded and replanted, and the subsequent yield noted. Results led the writer to the conclusion that in propagating the black raspberry there is no occasion for special selection of extra-productive parent plants or of extra large tips, provided the parent plant is healthy, and that comparatively little cane thinning should be done in pruning.

259. **Overholser, E. L. and others.**

634.75:581.12

Respiration studies of strawberries.

Plant Physiol., 1931, 6 : 549-57, bibl. 5 (published as *Sci. Paper* 177, *Coll. Agr., State Coll. Washington*).

The experiments were undertaken to determine the correlation of the rate of metabolism or respiration intensity as measured by the production of carbon dioxide with different fruit phenomena. The technique is described. The authors are led to conclude that (1) Firmness of tissue both in mature and immature berries is not correlated with low respiration intensity. (2) The respiration intensity increased with the maturity of the fruit. (3) Both mature and immature fruits picked at intervals in comparable states of maturity showed higher respiration intensity as the season advanced. (4) The respiration intensity of any one lot of mature or immature fruit increased with each succeeding respiration interval. (5) No apparent depression of respiration intensity followed the increased carbon dioxide contents attained in the respiration chambers resulting from a lengthening of the respiration period. (6) There were consistent differences between varieties in respiration intensity, which were not directly correlated with keeping quality, the latter being also affected by the firmness of the flesh.

* *J. Pom. Hort. Sci.*, 1929, 7 : 251-69.

260. **Wagner, F.** 634.7-1.8
 Düngungsversuche bei Beerenobst, 1907-26. (Manurial trials on small fruits),
 being Pt. 2 of Wissenschaftliche Obstbaum-u. Beerenobstdüngungsversuche in
 Weißenstephan.

Arbeiten der Deutschen Landwirtschafts-Gesellschaft, Hft. 377, 1931, pp. 79-111.

Trials carried out in the open under carefully controlled conditions of soil and manure applications (see H.A., I, No. 248). The obtaining of reliable experimental results was in some cases made more difficult by the necessity for replanting, and by the fact that the material was obviously not so uniform as its original appearance had given cause to believe. This was seen by differences not only in growth but in disease susceptibility. The effect of manures was much more quickly seen than in the pear tree trials. With the Red Dutch Currant N and K_2O deficiency depressed cropping considerably, P_2O_5 deficiency less. Initially N deficiency greatly affected this plant, but with increasing age it showed a capacity for getting the required N from the supplies in the soil. All three nutrients were found to be concerned in sugar formation, no particular effect of K_2O being noticeable. Black currants were much influenced by the withholding of N, but little by that of K_2O and practically not at all by that of P_2O_5 . Whinham's Industry gooseberry needed K_2O and P_2O_5 , but was able to get on without the addition of N, its crop under complete manuring conditions being less than that when N was withheld. In all the above cases wood production ran practically parallel with fruit formation. The Marlborough raspberry crop was much depressed by withholding N, but K_2O and P_2O_5 had little effect. The Hansa strawberry responded well to N but not so the Queen Louise. Potash deficiency became apparent in red currant bushes in July in brown dead leaf margins as also in weaker growth and earlier leaf fall. Such symptoms were not so obvious with black currants.

261. **Partridge, N. L. and Veatch, J. O.** 634.8-1.4-1.8
 Fertilizers and soils in relation to Concord grapes in South Western Michigan.
Michigan State Coll. Agr. Exp. Sta. 1 ech. bull. 114, 1931, pp. 42.

Five years' fertilizer experiments on a block of Concord grapes set in 1907 and giving an appearance of comparative uniformity in 1923, when the treatments started. Among the authors' notes and conclusions are the following: The soil is prevalently sandy, dry and low to medium in natural productivity. Some variations are found in surface subsoil. Applications of nitrogen influenced the growth and production of vines on areas that received no fertilization at a distance of 15 ft. from the plot margin, but not at 25 ft. If the relative merits of different fertilizers are to be determined, comparisons between vines of similar initial vigour must be made. The application of nitrogen, either as ammonium sulphate or nitrate, resulted in an increase of weight of prunings and of production of fruit. The percentage increase in weight of prunings was greater than the percentage increase in production, especially in vines initially most vigorous. There was a more or less similar additional increase in growth and productivity following the addition to the nitrogen application of acid phosphate or muriate of potash, but little further increase when both were added. The applications of fertilizers seem to have reduced the variability in production between vines, by reason of their greater effectiveness in increasing the yields of the weaker vines. The applications gave the largest percentage of increase in 1925, an "off" year.

262. **Ferrara, A.** 634.8(65) + 663.2(65)
 L'industria viti-vinicola dell'Algeria. (Viticulture and vinification in Algeria.)
L'Agricoltura coloniale, 1930, 24 : 544-7, 569-89, 627-48, and 1931, 25 : 19-36,
 65-90, 124-45, 176-98, 229-43, bibl. 16 in text.

The author deals with his subject first from a historical, economic and sociological standpoint, showing the rapid development of viticulture and wine making and their tremendous influence in moulding Algeria into a real France beyond the seas. On the technical side he deals more

fully with the oenological and by-products aspects, giving photos and diagrams of the latest, extremely efficient, large scale apparatus used. He stresses the close co-operation between growers, wine makers and such scientific institutes as the Oenological Department of the Agricultural Institute at Maison Carrée, the Oenological Institute of Algeria and the Pasteur Institute of Algeria. The science of viticulture is particularly studied at the Agricultural Institute at Maison Carrée, the Philippeville School of Agriculture and Viticulture and at the Experiment Stations attached to the Agricultural School of Sidi-bel-Abbés and to the Farm School of Ain-Temouchent.

The chief vines grown are: (1) Red—Carignan, Cinsault or Hermitage, Mataro, Morastel, Mourvedre, tintoria Bouschet, Alicante Grenache, Aramon, Cot de Chésagas and (2) White—Clairette, Ugni blanc, Ain el Kelb, Ferana. In Oran the sandy soil still allows of planting vines on their own roots, but elsewhere Rupestris du Lot holds first place as a rootstock. It is, however, being gradually displaced especially by Berlandieri hybrids and others, of which a list is given. The quality of wine produced becomes better yearly. At present of the 200 million gallons exported yearly about $\frac{2}{3}$ is wine from the plains (alcohol 11-12%, which compares favourably with the content of average wines from France), nearly $\frac{1}{3}$ "hill" wine (alcohol 11-13%) and about $\frac{1}{10}$ first class "mountain" wine (alcohol 12-14%).

263. **Zillig, H. and Herschler, A.** 634.8-1.4-1.8

Bodenuntersuchungen zur Klärung von Wachstumsstörungen an Reben im Weinbaugebiet der Mosel, Saar und Ruwer. (The investigation of growth disturbances in the grape vine in the vineyards of the Mosel, Saar and Ruwer by soil surveys.)

Arbeiten aus der biologischen Reichsanstalt für Land- u. Forstwirtschaft, 1931, 18: 507-81, bibl. 74.

The authors describe the geology and climatic influences of the district. They then proceed to a detailed account of the technique used and results obtained in their mechanical, physical and chemical investigations, as also in their biological examination and determination of catalytic strength and pH reactions. Practical hints are given to the vine growers of those parts and notes are added as to the efficacy of certain analytical methods. Thus they conclude that Lemmermann's method for the determination of soluble P_2O_5 , and Neubauer's for that of P_2O_5 and K_2O may both be used to determine the amounts of these substances available to the vine, the former being preferable by reason of its shortness, when P_2O_5 alone is under question. Lime determination is satisfactorily done by the gasometric method. For nitrogen no method has been found satisfactory. They recommend that the above analyses should be made where failure of vines occurs and is definitely not due to old age, disease or climatic conditions. Lime determination is naturally unnecessary where the pH is below 6. Only where the reaction is strongly acid should a determination of the K_2O content and exchange acidity by Daikuhara's method be necessary. They note that investigations are being made with the object of discovering a simple, inexpensive method of determining the vine's nutrient requirements.

264. **Croce, F. M.**

634.51-1.542

Poda de fructificación del nogal. (The pruning of walnuts.)

Revista Mensual B.A.P., 1931, 14: 164: 39-40.

Although it is usually considered unnecessary to prune walnuts, once the shape of the tree has been established, it is contended that more fruit would be carried if a light thinning of branches were given annually. As usually grown the tree is crowded with a mass of branches which exclude light and air and so prevent the formation of much fruit which would be produced under more open conditions. Since the fruit is borne on terminal shoots these must not be shortened. All that is necessary is the removal of redundant branches in their entirety.

CITRUS AND SUB-TROPICAL CROPS.

(See also under STORAGE and PACKING.)

265. **Tanaka, Y.** **634.3-1.541.11/12**

The inter-relation between scion and stock in citrus, with special reference to the influence of scion on stock. [Japanese-English summary.]

Studia Citrologica, 1931, 4 : 213-27, bibl. 17.

Ten varieties of citrus were grafted on 3 year old seedling trifoliate stock to the number of 798 individuals. Two years later ten plants of each, subsequently reduced to eight or less to eliminate all irregularities, were dug up, carefully examined and measured. The following general conclusions were formed : 1. When stock and scion are not congenial, development of top and root is poor. 2. When stock and scion are congenial, the habit of the top is strongly reflected in the growth of the root. As an example, trifoliate stock carrying sweet orange is deep rooted, with the angles of the root branches narrow ; but when carrying lemon it is shallow rooted, with wide angled root branches, and the colour of the roots is lighter. With all the species tested trifoliate stock always showed the characteristic swelling of the crown immediately below the union, but in a greater or less degree according to species.

266. **Tanaka, T.** **634.3**

The original habitat of citrus species. [Japanese-English summary.]

Studia Citrologica, 1931, 4 : 179-205, bibl. 38.

A detailed account is given of the natural distribution of citrus species in Eastern Asia. The author claims Eastern India (Vavilov's Region II), as the region where citrus originated, with 1. Indo-Malaya, East Indies and the Pacific Islands, 2. Yangtze River, 3. Southern China and 4. Japan, as branches radiating from that centre, each with its connecting forms.

267. **Haas, A. R. C. and Klotz, L. J.** **634.3:581.192:546.27**

Some anatomical and physiological changes in citrus produced by boron deficiency.

Hilgardia, 1931, 5 : 8 : 175-97, bibl. 9.

Data were obtained from 2 year old budded grape fruit (*Citrus maxima* Merrill) and Valencia Orange (*Citrus sinensis* Osbeck) trees grown in sand cultures in galvanized iron containers. Among their conclusions are the following : Boron deficiency is marked by a gradual reduction in the size of the shoots produced. Boron seems to be essential for cell division in the meristematic tissue of growing points and is also essential for cambial activity. When boron is deficient, the cambium and parts of the phloem disintegrate. The xylem disintegrates less, if at all. Gum is formed copiously and finds its way out through a split in the cortex. When growth has ceased and gum been formed as a result of boron deficiency, the addition of boron to the culture solution has been the means of producing recovery. This recovery is accompanied by a reduction of the total sugar content of the leaves. The abnormal accumulation of carbohydrates in the leaves of boron-deficient citrus, coupled with the fact that the phloem tissues are destroyed, show that translocation is seriously affected.

268. **Haas, A. R. C. and Halma, F. F.** **634.3:581.192**

Sap concentration and inorganic constituents of mature citrus leaves.

Hilgardia, 1931, 5 : 13 : 407-24, bibl. 5.

A report based on a 2 year investigation. In 1927-28 the freezing point depression of the sap was determined on leaves taken from several orchards. During 1928-9 leaves for study were taken from one orchard throughout the year. Their data, which are given graphically, lead the authors to the following conclusions : Sap concentration of mature leaves of Eureka lemon,

Navel and Valencia oranges is related to seasonal changes in soil and air temperatures. The sap of lemon leaves is consistently more dilute than that of orange, but the fluctuations coincide. Inorganic constituents of dried citrus leaves and of sap seem to be related to the age of the leaves rather than to environmental changes. There are indications that a new growth cycle draws on the inorganic supply of the subtending growth cycle.

269. **Allison, J. R.**

634.3:581.192:632.941

Quantity of oil retained by citrus foliage after spraying.

Calif. Citrograph, 1931, 16 : 481.

The investigations were carried out by the Research of Sprays Department, Leffingwell Rancho Co., Calif. The soluble wax content of leaves from unsprayed trees out of various orchards seems to be very uniform, and the difference between orange and lemon leaves is very slight. The investigator thinks that this fact will obviate the necessity of always sampling the trees for oil content before spraying, when it is desired to determine the actual oil left after spraying. The method used was that described by English in *J. Agr. Res.*, 41 : 131-3. Tables are given showing the actual results of the experiments which may be briefly interpreted as follows : Lemon leaves retain a larger quantity of spray oil than orange leaves. Generally speaking the foliage retains more of the heavy oils than of the lighter ones. A solution containing good spreader materials left a smaller quantity of oil than solutions giving a less perfect spread. The formula and method of preparing spray oils are important in determining the amount of oil retained and also influence appreciably the extent to which the oil enters the tissues. The quantity of oil that may be safely retained by citrus foliage is surprisingly small.

270. **Bonnet, J.**

634.63

Un centre d'études de variétés d'oliviers. (A testing place for olive varieties.)

Rev. de Viticulture, 1931, 24 : 233-7.

A trial ground of about 12 acres has been acquired at Bel-Air, Chemin de la Paillade, Montpellier, France, for the testing of olive varieties and eventually the issue of tested varieties to growers in the district and presumably elsewhere. Its aim is to choose out all types of dessert olives and in addition some 20-25 varieties as being specially good oil producers. Its collection already comprises 20 varieties of Italian origin, 10 from Spain and Portugal, 8 from North Africa, there being 4 specimens of each variety. In collecting French olives attention has been confined to the following : (1) Dessert olives—Lucques, Picholine, Amellau, Groussane, Verdale, Plant de Belgentier, Plant de Nyons ; (2) Oil olives—Cailletier, Cayon, Pardiguiet, Gros Ribier, Brun, Salonen, Aglandau, Olivière, Rouget, Corniale, Redonal, Pigale. Grafting will be done on seedlings and Picholine will be used as scion in the first instance.

271. **Woodman, R. M. and Wiley, W. J.**

632.51

The eradication of prickly pear by chemicals, with particular reference to emulsions in the systems phenols-gelatin—aqueous arsenic acid.

Chemistry and Industry, 1931, 50 : 22 : 187T-9T, bibl. 8.

It is argued that when spraying for the eradication of prickly pear, emulsions containing aqueous arsenic acid solutions and the cresols as liquid phases, with gelatin or glue as the emulsifier, should preferably be of the aqueous arsenic acid-in-cresols type.

The arsenic acid present is demonstrated to favour this desirable type, any tendency to formation of the opposite type possessed in the absence of the acid being thus suppressed. (Author's summary.)

TROPICAL CROPS.

(See also under STORAGE and PACKING.)

272. **Niklas, H. and Schropp, W.** 631.8

Über einige Düngungsversuche zu subtropischen u. tropischen Nutzpflanzen unter besonderer Berücksichtigung der Phosphorsäuredüngung. (Fertilizer experiments with sub-tropical and tropical economic plants with special reference to phosphates.)

Tropenpflanzer, 1931, 34 : 269-77.

The authors describe N.P.K. pot experiments at Weißenstephan, Munich. Part of the experiments were on the effects of P deficiency, one of the more striking results being obtained with coffee seedlings where the addition of P was most effective. The effect of P on Turkish tobacco was very striking, and only slightly less on Havana tobacco.

273. **Albert, W. B. and Armstrong, G. M.** 633.51-1.432.2:581.148

Effects of high soil moisture and lack of soil aeration upon fruiting behaviour of cotton.

Plant Physiol., 1931, 6 : 585-91, bibl. 9.

An unusual shedding of very young cotton fruit buds was observed in 1928 in the coastal section of S. Carolina. The young buds turned a distinct brown colour and were aborted in most cases at the ages of 1 to 5 days. There was no sign of insect attack. Relatively low temperatures and frequent rains, resulting in the soil being near saturation point during the time of bud formation, suggested that poor soil aeration might be a factor in influencing the fruiting behaviour of the plants. To test this 250 plants were grown on each of two similar plots of sandy loam, one acting as a check, the other receiving $\frac{2}{3}$ in. tap water daily in an attempt to keep it at or near saturation point. The soil moisture content, hydrogen-ion concentration, nitrate content, carbon dioxide and oxygen content of the soil air of both plots was obtained at intervals. Tests were also made for nitrites, ferrous and ferric iron of the soil solution. In the result plants grown on the wet plot shed a larger percentage of fruit buds. The percentage of oxygen was lower and the percentage of carbon dioxide higher in the soil of the flooded plot and this fact is associated with the increase in the percentage of shedding of fruit buds.

274. **Harrison, G. J.** 633.51:581.162.3

Metaxenia effects in cotton.

J. Agr. Res., 1931, 42 : 521-44, bibl. 9.

Varieties tested for metaxenia, i.e. the effect on the tissues of the mother-plant of cross pollination, were Pima, Hopi, Durango and Acala Upland. Metaxenia effects were definitely shown in length of time required for fruit to mature, length of lint and degree of fuzziness of seed and are here detailed. This indicates the inadvisability of growing two cottons of wide divergence in staple length in the same vicinity, since the uniformity of both varieties is likely to be impaired as cross fertilization occurs.

275. **Williams, C. H. B.** 633.61-1.8

Manurial experiments with sugar cane, II.

Agr. J. British Guiana, 1931, 4 : 59-68.

One experiment took the form of a latin square with seven treatments and seven replicates of each treatment. The soil was a highly acid, heavy silt. The result showed that on this soil Kerazotine and Leathermeal, two proprietary organic nitrogenous fertilizers, were not more efficient than sulphate of ammonia. A further conclusion is tentatively put forward that 600 lb.

sulphate of ammonia per acre will probably prove an economically sound dose for plant canes on ploughed lands in this section. The second experiment was to determine the optimum dose of pulverized limestone for a typical field on the Sophia Sugar Exp. Sta., which is similar to large areas of the Colony's sugar belt, a heavy silt soil of marked acidity. The layout consisted of six treatments with six replicates of each arranged in latin square. The canes selected were plant canes of B.H. 10(12). It was demonstrated that statistically significant increases were obtained over the controls and over each other by doses of 3, 6 and 9 tons respectively, of ground limestone broadcast before planting and incorporated into the soil during tillage. A dose of 12 tons per acre failed to increase the yield over 9 tons. The addition of half a ton of ground rock phosphate tended to depress the yield.

276. **Bird, M.**

633.61-1.453

The toxic action of magnesia on cane.

Facts about Sugar, 1931, 26 : 263.

The mysterious trouble in the alluvial sugar cane lands of British Guiana resulting in the death of many stools has been found to be due to an excess of magnesia in the soil. This condition can be rectified by the addition of lime, which should be present in quantities at least double that of magnesia. If applied as a hydrate, or tempered lime, it precipitates much of the magnesia as an insoluble and harmless compound.

277. **Dutt, N. L. and Krishnaswamy, M. K.**

633.61:581.162.3

A preliminary note on stigma receptivity in certain sugar cane varieties.

Indian J. of Agr. Sci., 1931, 1 : 286-8, bibl. 5.

Observations to determine the length of time of stigma receptivity in certain sugar cane varieties. For hybridization work the arrow has to be pollinated every morning as fresh stigmas are exerted. If the receptivity of the stigmas is longer than the period of the opening of the flowers in the whole arrow, cross pollination may be done in one operation. It was found that 49 per cent. of the pollen germinated on 5 day old stigmas, and on such stigmatic branches as had not dried there were germinations even on 11 day old stigmas. Pollen also germinated on stigmas dusted 24 hours before they opened. Further observations are to be made to ascertain the length of the period during which the flowers remain receptive to fertilization, the present test having dealt only with the germination of the pollen on the stigma.

278. **Wellensiek, S. J.**

633.72-1.521

Verslag over de periode 1921-1930 en toekomstige ontwikkeling der thee-selectie. (Report during the period 1921-1930 and future development of tea selection.) [English summary.]

Archief voor de Theecultuur in Ned. Indie, 1931, No. 2 : 101-12, bibl. 7.

A report on the work of his predecessor Dr. C. P. Cohen Stuart, during the period 1921-30 with the author's suggestions for the future development of the work in the Dutch East Indies. Seed selection for the immediate improvement of tea estates, which is done on well defined lines, should be kept distinct from fundamental research work. Vegetative propagation and nursery selection need urgent attention. The former has so far yielded disappointing results, since the present method of grafting gives most uncertain results. Fresh methods are to be tried. Special attention will be given to the influence of stock on scion. In nursery selection the relation between seed weight, diameter and height of stems, weight of branches and foliage of nursery-plants at different ages on the one side and leaf yield capacity of plucking bushes grown from these plants on the other, will be studied. Another study will be the inheritance of leaf yielding capacity. As complete a collection of tea varieties as possible is to be made, up to 1,000 plants of each kind.

279. **Prillwitz, P. M. H. H.** **633.72-1.543.1**

Albizzia sumatrana als schaduwboom in theetuinen. (*Albizzia sumatrana*, a new shade-tree for tea plantations.) [English summary.]
Archief voor de Theecultuur in Ned. Indië, 1931, No. 3 : 129-34.

Albizzia sumatrana, of which a description is given, is claimed to be superior to the commonly used *A. falcata*, in that it is a quicker grower and more suited to high altitudes. It gives better results on badly washed slopes, while its habit of growth provides an excellent shade without the necessity of topping. It bears seed when 5 to 6 years old, whereas *A. falcata* may not bear even at 12 years of age. *A. sumatrana* appears to carry as many root nodules as *A. falcata*. Its wood is more brittle, however, so that it is not so well suited to exposed positions. In poor soils where quick results are needed *A. sumatrana* is particularly useful.

280. **Eden, T.** **633.72-1.55**

Studies in the yield of tea.

I.—The experimentation errors of field experiments with tea.

J. Agr. Sci., 1931, 21 : 547-73, bibl. 15.

(1) A uniformity trial of 144 plots of mature tea plucked on 42 occasions is examined with a view to determining an adequate technique for field experiments. (2) Yields are expressed as dry matter, the necessity for and accuracy of this procedure being examined. (3) Using the latin square and statistical analysis of variance, a maximum diminution of error up to plot sizes of one-eighteenth acre is found; the elimination of positional variance is shown to be inferior to that generally obtained on annual crops in temperate climates, but this inferiority corresponds with similar experience on other tropical crops. (4) An examination of errors of yield curves over the whole of the separate occasions reveals a significant consistency between behaviour on successive occasions, differential variances with respect to occasions being small. That for columns is significantly greater than that for rows, and on consideration of the arrangement of the experiment this greater value is attributed to variation in the standard of plucking attained on the various occasions. (5) The use of intermittent yields (every third plucking round) as a labour-saving device gives valid comparisons between treatments without an appreciable increase in error. (6) The application of Sanders' method for correcting experimental yields on the basis of previous cropping gives satisfactory results of greater promise than in the case of annual crops. (Author's summary.) Details of the primary data of this experiment will be published as Bulletin No. 6 of the Tea Research Institute of Ceylon.

281. **Garretsen, A. J.** **633.72-1.543**

Plantverband en uitdunning bij de theecultuur. (Planting distance and thinning out in tea growing.) [English summary.]

Archief voor de Theecultuur in Ned. Indië, 1931, No. 2 : 63-99.

In a series of experiments begun in September, 1926 and September, 1927, in several tea gardens, every other bush was removed, leaving a final spacing of 6' by 4'. By 1930 some of the treated gardens already showed increased production, but others did not. It is obvious that the removal of alternate plants in established gardens will mean the elimination of good as well as bad yielders and the only point of such treatment would be to get more space for the development of those left. To increase actual production a more gradual and selective method would appear preferable. Bushes which judged by appearance needed thinning existed in the proportion of 1 to 3 as compared with those whose insufficient production suggested elimination.

282. **Gadd, C. H.** **633.72-1.542-2.4**

The pruning of tea in relation to disease.

The Tea Quarterly, 1931, 4 : 45-50.

Pruning is a necessary evil to maintain crop, but if it leads to the death of plants, its object is defeated. When hard pruned it is necessary for the bushes to have accumulated reserves

of internal food material to ensure recovery, and to provide this a rest from plucking of two months prior to pruning is advocated at any rate in the low country. When pruning the cuts should be made close to a bud, the old practice of leaving pegs being fundamentally unsound. Wounds made by pruning should be covered with tar, tar and wax, whitelead paint or some suitable proprietary mixture. Comparing clean pruning with "cutting across," it is pointed out that the former enables a thorough cleansing of the bush to be carried out and diseased branches to be seen and dealt with, whereas under "cutting across" they would have escaped notice. A system which appears to be highly successful is described, whereby trees are clean pruned every eight years and cut across alternate years. Since it is difficult to get the average coolie to prune close to a bud, a certain amount of dieback is bound to occur. To combat this, it is suggested that a secondary pruning should be made a few weeks later by skilled men only, who would cut out any die back and cut back the snags and pegs left by the ordinary pruners. Pathological problems associated with pruning do not admit of curative treatment but can be obviated by preventive methods.

283. **Tubbs, F. R.** 633.72-1.542

Some physiological aspects of pruning.

The Tea Quarterly, 1931, 4 : 40-44.

A description of the physiological effects of pruning in general is followed by their application in the case of the tea plant. The normal clean pruning and the "cut across" or light pruning methods are discussed with reference to their respective effects upon production and on the health of the plant. The author considers that further investigation is needed.

284. **Curtler, E. A.** 633.83

Cardamoms.

Malayan Agr. J., 1931, 19 : 271-6.

A description of the methods of growing, harvesting and marketing this crop in India and Ceylon, with the suggestion that it might be suitable for growing in the Highlands of Malaya.

285. **Sethi, R. L.** 633.853.55(54)

Observations on the castor-oil plant (*Ricinus communis*) in the United Provinces. (Paper read at the Agriculture Section of Indian Science Congress, Nagpur, Jan., 1931.)

Agriculture and Live-stock in India, 1931, 1 : 243-62, bibl. 4.

The following general conclusions are reached, apart from those of purely local application. Manurial trials showed that cow-dung gave the best results in increasing yield and vegetative growth, while "neem" (*Azadirachta indica*) cake increased the oil percentage and helped to repel insect attacks.

The small seeded varieties showed a greater percentage of oil than the large seeded. The central branches bear the largest number of fruits and the seeds have a higher oil content than the side branches. The oil content depends more on the degree of maturity than on any other factor, even a few days making a considerable difference in the oil percentages. The ideal plant should have big, densely crowded fruiting racemes, high yield, indehiscent, thin walled capsules of uniform maturity, containing small sized seed of highest possible oil content. The breeding of such varieties is in progress. Castor oil seems to succeed best as a boundary or mixed crop, and attempts both in India and the United States to grow it as a single crop have failed through attacks of a fungoid disease (*Botrytis* sp.)

286. **Kerbosch, M.** 633.88.51(92.2)

Cinchona culture in Java. Its history and present situation.

Malayan Agr. J., 1931, 19 : 291-6 (Abstract from *Geneeskundig Tijdschrift voor Ned. Indië*, 71, 4, April, 1931).

In 1852 the Dutch Government decided to establish plantations of quinine in Java. Seeds and plants were collected in Brazil and plantations formed. But these varieties showed only

a low yield of quinine (1-1.5%). Accordingly in 1865 a pound of seed of a new variety was purchased from Charles Ledger. The trees thus raised showed a surprisingly high quinine content (from 8-13%) and private enterprise became attracted. Free seeds and cuttings were issued by the Government and many plantations were started. By selection and other methods the *Ledgeriana* type has been still further improved and a grafting technique has been evolved, whereby *C. Ledgeriana* can be grafted on to *C. succirabra* stock, and so be planted on poor soils where *C. Ledgeriana* itself would not thrive. The paper then gives an account of the Cinchona Agreement of 1913 between producers and manufacturers.

287. **Bobiloff, W.** 633.912-1.521
Identifying *Hevea* clones.
Trop. Agriculturist, 1931, **76** : 358-9. (Reprinted from *The India Rubber J.*, 1931, vol. 81, No. 12.)

In a preliminary communication to De Bergcultuurs of Dec. 27th, 1931, Dr. Bobiloff describes what appears to be a new and very important chemical method of distinguishing between *Hevea* clones. At present the clones are identified by a subjective examination of the external morphological characters. Briefly the discovery is that when treated by a certain reagent (not described) the latex of each clone gives a chemical reaction which differs in each clone but is constant for all individuals of that clone. After the addition of the reagent to the latex changes of colour take place and identification is made by observation of the time taken in colouring, the shades of colour, and its intensity, at least one of which will differ in each clone. Examples are given. The method is still in the experimental stage but has been applied successfully to a great number of clones both at the Experiment Station at Buitenzorg and also on several estates in West Java.

288. **s'Jacob, J. C.** 633.912:581.162.3
Proeven over kunstmatige kruis- en zelfbestuiving bij *Hevea brasiliensis*.
(Experiments on artificial cross- and self-pollination of *Hevea brasiliensis*.)
[English summary.]
Archief voor de Rubbercultuur in Ned. Indië, 1931, **15** : 261-88, bibl. 12.

A total of 24,500 pollinations made in 1930 produced 1,338 fruits or 6.4%. The genetic composition of either parent influences the percentage of setting and the influence varies with different trees. Cross-pollination gave a 7.3% set as against 6.1% for self-pollination, but there is no evidence to show that cross-pollination is the more frequent phenomenon in the natural state, although it is a popular idea that all *Hevea* is cross-pollinated and that all seedlings are therefore of mixed blood. In artificial pollination the best results were generally obtained when the female flowers had been open for 18 hours. Pollen from opened flowers proved slightly superior to pollen from closed flowers, but technical difficulties in collecting make the latter easier to use. In two experiments natural self-pollination occurred up to 15% when the whole inflorescence was enclosed in a muslin bag. There were indications that the period of ripening, which varied between 139 and 193 days depends on the genetic constitution of the parents, as also the germination capacity of the seed and the time taken to germinate.

289. **Cramer, P. J. S.** 633.912-1.557
New data on the latex tube bore in rubber.
Trop. Agriculturist, 1931, **76** : 276-83. (Reprinted from *Malayan Tin and Rubber J.*, 1931, **20**, No. 22.)

An analysis of Ashplant's theory that width of latex tube in *Hevea* is correlated with yield in the light of further investigations conducted by Frey-Wyssling (*Archief voor de Rubbercultuur in Ned. Indië*, Vol. 14, No. 3, March, 1930). The writer decides that yield and width of tube are not so well correlated as Ashplant imagined, and that while trees with narrow tubes are poor yielders those with wide tubes are by no means all good yielders. Since it is more important to exclude all poor yielders than to include all high yielders, the method fails. Applying this method to three sets of seed-grown trees of known yields and tube diameters, the

improved yield of trees selected on this basis would have still been far behind that obtained from clones of recognized high yield. Even supposing this method of selection to be perfect, there still remains the difficulty that to employ the technique successfully presupposes a scientific training which the average planter has not had and the use of instruments which he does not possess. The author concludes with the statement that the expert policy still is to bud with material from known, high yielding clones.

290. **Ashplant, H.** 633.912-1.557

Latex tube bore theory.

Trop. Agriculturist, 1931, **76** : 215-7.

Mr. Ashplant's reply to his critics. He claims that Frey-Wyssling's measurements really uphold his (Ashplant's) theory, in that Frey-Wyssling found that all poor bearers had narrow latex tubes, while a good yield was always associated with trees with a large bore. He agrees that the larger bores are also carried by some poor yielders; Frey-Wyssling, he says, merely disagrees with him in opinion as to the utilizability of the theory. Ashplant further says that the choice between budding and tube bore selection depends on local circumstances. He points out that it has taken the Dutch East Indies over 12 years to discover a dozen *élite* trees capable of transmitting their good qualities and even some of these were uncertain until recently. Outside the Dutch East Indies no proven bud mothers were available and in the prevailing uncertainty his method of eliminating the inferior trees was more dependable than budding adventures with unknown and frequently brown-bast tainted stock.

291. **Tengwall, T. A.** 633.912-1.556.8

No. 63. Resultaten van eenige proeven met Bosch-tapsystemen. (Results of some experiments with the Bosch tapping system.) [English translation.] *Archief voor de Rubbercultuur in Ned. Indië*, 1931, **15** : 171-97.

s'Jacob, J. C. Resultaten van enkele Bosch-tapproeven in het ressort v/h besoekisch proefstation. (Different tapping experiments with the new Bosch tapping system.) [English summary.] *Ibid.*, pp. 200-12.

The principles of these new systems are described by both authors. They were tried on several experiment stations and were in each case found to be inferior to any of the existing methods of tapping. The new Bosch tapping knife was also found to be inferior to the ordinary tapping knife. The authors cannot recommend the system.

292. **Tengwall, T. A.** 633.912-1.556.8

Resultaten van een tapproef met anderdaagschen tap over $\frac{1}{2}$ omtrek versus derdedaagschen tap over $\frac{1}{2}$ omtrek. (Results of a tapping experiment with alternate daily tap over $\frac{1}{2}$ circumference, versus tap every third day over $\frac{1}{2}$ circumference.) [English summary.]

Archief voor de Rubbercultuur in Ned. Indië, 1931, **15** : 251-9.

Data got from 34 tapping tasks, of which 17 were done on the $\frac{1}{2}$ circumference, alternate day system, and 17 on the $\frac{1}{2}$ circumference, every third day system, from March, 1928 to January, 1929. No difference in yield was disclosed, so that the system of $\frac{1}{2}$ circumference tapping every third day is preferable on the grounds of economy.

293. **Martin, G. and Elliott, L. E.** 633.912-1.562.4

The cause of variability in the plasticity of plantation rubber after storage.

Trop. Agriculturist, 1931, **76** : 342-4.

Tests carried out by De Vries in Java showed that (1) freshly prepared plantation rubber is uniform in plasticity but that many samples gradually become hard or soft on keeping; (2) rubber containing more serum substances becomes hard and that containing less than

usual becomes soft. (*Trans. R.R.I.*, 3, 1927-28, p. 284.) Tests carried out under the Research Scheme show that in most cases rubber becomes harder on keeping for 6 months at 15°C. Further experiments have now been made with crepe and sheet stored for 6 months at 0°C., 15°C., 30°C., and 45°C. Results show that stored in nitrogen rubber becomes hard, the hardness increasing with the temperature, but that stored in oxygen it is always softer than when it is stored in nitrogen at the same temperature, and that the difference increases with the temperature. From these results it would seem that the fundamental factors responsible for the changes occurring in the plasticity of rubber in storage are (1) a spontaneous hardening which occurs in nitrogen and therefore probably in any inert atmosphere, and (2) a softening induced by oxygen. The changes occur simultaneously when oxygen is present, but an increase in temperature accelerates the rate of softening more than the rate of hardening. At low temperatures, however, hardening exceeds softening, the critical temperature being about 30°C., though depending upon accessory substances in rubber. Ammonia extracted rubber softened in oxygen at 45°C. and hardened at 15°C.; untreated with ammonia it tended to harden at 45°C. Water extracted rubber softened in oxygen at 45°C., but to a lesser extent. The differences between the effect of storage in the tropics and in Europe are thus explained. At European temperatures spontaneous hardening nearly always exceeds softening due to oxygen, in tropical conditions rubber becomes hard or soft according to the amount of serum substances present containing natural anti-oxidants.

294. **Haas, A. R. C. and Klotz, L. J.** 634.62-2.8
Nutrition and composition of the Deglet Noor Palm in relation to the "Decline Disease."
Hilgardia, 1931, 5 : 16 : 511-30, bibl. 8.

The authors have made various analyses of diseased and healthy plants. They note that diseased pinnae are lower in carbohydrates, total nitrogen, potassium and phosphorus, but higher in calcium than healthy pinnae, their content of sodium, magnesium, total sulphur and total chlorine being about the same. The experimental addition of 16 lbs. CuSO_4 in solution on November 30th, 1929 and 34 lbs. on January 4th, 1930 to the soil around one diseased palm effected a great improvement as shown by new growth and the composition of the pinnae. Control palms did not recover. Notes on the composition of the pinnae, and pulp and roots are given. They consider that certain elements such as beryllium may be very toxic to Deglet Noor date seedlings.

295. **Agote, F.** 634.653(72.91)
Nuevas variedades de aguacates en la estacion experimental agronomica.
(New varieties of Avocado at the Agricultural Experiment Station.)
Revista de Agricultura Comercio y Trabajo, 1931, 11 : 11 : 14-17.

A collection of Avocados is being made by the Cuban Horticultural Department and the present article describes in some detail the characteristics of a number of the latest arrivals, grouping them under the headings West Indian, Guatemalan, Mexican, and Hybrids, twenty-three in all being dealt with. The points particularly noted in each are origin, fruiting capacity, time of ripening and the weight and quality of fruit.

296. **Skutch, A. F.** 634.771:581.144
Some reactions of the banana to pressure, gravity, and darkness.
Plant Physiol., 1931, 6 : 73-102, bibl. 10.

A study of the banana has shown that, when a section is removed from the side of the false stem, the emerging leaf, deprived of its lateral support will break out through the aperture, forming a forked false stem. Grown plants when bent over re-erect themselves from the base. When inclined at an angle of 45° or less with the ground, erection is accomplished principally

by the curvature of the false stem at the base. The sheaths on the lower side become thicker and there is a decrease of starch on this side. In the rhizome the cortical cells elongate parallel to the long axis of the plant and divide by transverse walls. The cell walls become thinner and their starch grains largely disappear. The whole cortex becomes thicker on the lower side. As a result the false stem is pushed upwards. A sucker planted in an inclined position does not re-erect itself but the young leaves, as soon as the root system is established, burst through the upper side of the old false stem and form a new one in an upright position. When placed in darkness the leaf sheaths become abnormally long and false internodes of about twice the usual length are formed, but when sheaths, from which the laminae have been removed, are placed in darkness, they do not become abnormally long. The removal of laminae in the open also does not affect the length of the sheath. The fact that laminae kept in continuous darkness exert some influence resulting in the increased elongation of their sheaths about a metre distant is attributed to the action of a hormone, Went* being cited in support.

297. **Stratton, F. C. and von Loesecke, H.** 634.771:581.17
Changes in osmotic pressure of bananas during ripening.
Plant Physiol., 1931, 6 : 361-5.

Tests made at the Research Laboratories of the United Fruit Company showed that osmotic pressure changes during the ripening of bananas are such as to bring a transfer of water from peel to pulp, as well as from the stalk through the crown and neck to the peel and pulp.

298. **Parsons, T. H.** 634.441(54.87)
The Mango in Ceylon.
Trop. Agriculturist, 1931, 76 : 199-211.

Of the five native types only two are worth preserving, i.e. "Rupree" and certain varieties of "Jaffna." Nine good Indian varieties suitable for growing in Ceylon are described and the choicer varieties of other countries are named. An account is given of cultural practices and requirements and of propagation methods. Propagation is by inarching or patch budding, preferably the latter, on the wild mango stock. This position of the scion on the stock is said to influence the vigour and flowering age of the scion. A hardy rootstock is also said to be able to impart its frost resisting powers to the scion, an instance being quoted where scions from tender trees became quite frost resistant without deterioration in quality when grafted on the hardy seedlings from the Pachmiri hills. In the eastern tropics the seed is usually mono-embryonic, while in the western tropics it is more frequently polyembryonic. When propagating, the buds should be selected from the second or third flush below the growing point and the leaf blades removed some three weeks beforehand.

299. **Sayed, I. A.** 634.573
The cashew nut or the "tropical almond." (*Anacardium occidentale*).
Poona Agr. Coll. Mag., 1931, 23 : 33-6.

This article deals with the processing or curing of the nuts as carried out in India. The nuts after detachment from the "apples" are first dried in the factory drying yard, roasted and shelled. The kernels are then placed in drying ovens, heated to 70°C., for six hours, when they are removed and the skin of the kernel is peeled off. In order to prevent cracking, the peeled kernels are placed in moist chambers for 2 or 3 hours, after which they are graded and carefully packed in tins holding 25 lbs. The air is removed from the containers by a vacuum pump and they are sealed. The market possibilities are discussed.

* Went, F.W., *Wuchsstoff und Wachstum*. Recueil des trav. bot. neerl. 1928, 25 : 1-114.

300. **Sands, W. N.**

634.58

The Bambarra ground nut in Kedah.

Malayan Agr. J., 1931, 19 : 339-40.

The composition of the Bambarra ground nut (*Voandzeia subterranea* Thou.) approaches that of an ordinary normal food ration and it does not therefore require mixing with additional foodstuffs. Both nut and leaves form a useful fodder. Ground it forms a very white meal which makes an excellent soup, while the seed ripe or unripe is used as a vegetable. The soil preferred is a well drained sandy loam. The crop is harvested by pulling up the plants, and, as the nuts are not easily detached from the stalks, very few are left in the ground so that little labour is required. Its thick mass of foliage means that very little weeding is needed. The yield per acre is from 800-1,000 lbs. and two crops can be obtained yearly, all produce being consumed locally in preference to the ordinary ground nut (*Arachis hypogaea*).

STORAGE.

301. **Broadfoot, H.**

664.85.11/13:656.6

A report on the shipment of apples and pears to Hull by New South Wales growers in April, 1930.

Rept. of Dept. Agr. New South Wales, 1931, pp. 39.

A consignment of fruits, the largest organized shipment yet sent from New South Wales, consisting of apples 29,128 cases, pears 124 cases, 1,969 half cases and 4,484 trays, left Sydney for England by s.s. Port Hunter on April 5th, 1930, arriving at Hull on June 5th. The consignment was accompanied by the author, who describes in detail the ship's refrigerating installation, i.e. Hall's CO₂ refrigerating machine using brine as a cooling medium. Several inspections were made during the voyage, and the temperatures of individual fruits taken. Broadfoot observes that pre-cooled and hot fruit may be placed in the same hold and carried satisfactorily, but pre-cooling presents a number of advantages which are discussed. It is unsatisfactory to carry pears and apples in the same hold, pears requiring a lower temperature. Of the apples exported Granny Smith seemed to be the most satisfactory. It appeared immature by the iodine test, but the fruit opened up well, did not shrivel, developed a good flavour and had a long after-storage life. Maturity tests do not always give a true indication as to the most suitable time for picking apples. Some varieties immature by the tests arrived in perfect condition. Greatest loss is due to overmaturity. Factors causing this are enumerated. The chief varieties of apple grown in New South Wales are considered from the standpoint of suitability for export. Packing cases are dealt with. The soft wood packing cases so much in use, are considered to be the cause of much damage to fruit. Hardwood cases lined with corrugated cardboard are strongly advocated. The remaining pages contain very full information on the markets and marketing methods of the United Kingdom and the rest of Europe.

302. **Allen, F. W.**

634.11/13-1.547.6:547.313.2

The influence of ethylene gas treatment upon the coloring and ripening of apples and pears.

Proc. Amer. Soc. Hort. Sci., 1930, 27 : 43-50, bibl. 7.

Apples.—The apples treated were Gravenstein fancy grade, medium size and commercially packed from six different districts in California. The gas treatments were given beginning the second day after picking and lasting for 4 and for 10 days, the chambers being opened and regassed each second day. The gas concentration was 1 to 1,000 and the temperatures 50° and 70°F. The normal colour should be a light yellow ground colour, preferably with red streaks. Speaking generally the treatment induced yellowing in about 50 per cent. of the

green fruit, but did not influence the red colour. The higher temperature had a more decided effect than the lower. Wrapped and packed fruit was affected to the same degree as unwrapped. Pressure tests taken after 10 days at 70° showed an average difference of 3 pounds between the treated and untreated fruit, at 50° there was only one pound difference. Treated early picked fruit ripened one day ahead of untreated. Late picked samples showed no difference. Bitter pit may be lessened by the treatment but cannot be prevented. Some of the treated samples were of a noticeably better dessert quality. *Pears*.—The treatment was as for apples, but at 70° only and for periods of 3 to 4 days. It appears capable of increasing the colour and hastening ripening of early picked fruit, the most marked effects being when the treatment is given immediately after the fruit is harvested.

303. **Bracewell, Mary F. and others.**

634.11:577.16

The anti-scurvy vitamin in apples.

Medical Research Council, special report series 146, 1930, pp. 45, bibl. 7.

The authors have tested many varieties of apples from many sources in the Empire, including Dessert varieties:—Worcester Pearmain, Cox's Orange Pippin, Cleopatra, Jonathan, Strawberry Pearmain, King; Cooking varieties:—Bramley's Seedling, King Edward; Cider varieties: Woodbine and Dabinett. Among the conclusions reached by them are the following: Bramley's Seedling was decidedly more active than any other variety. There were no indications that soil or age of tree had any effect on the antiscorbutic activity. Bramley's Seedlings picked 14 days before the main crop did not differ appreciably in vitamin C content from the main crop. Little loss occurred in vitamin C content of apples stored at 1°C. in air or at 10°C. in a mixture of carbon dioxide, nitrogen and oxygen for about three months. The gas stored apples showed, however, a greater deterioration in the vitamin. With imported apples activity was found to be higher, the shorter the time elapsing between picking and testing the fruit. The heating of Bramley's Seedlings in their skins hardly affected their antiscorbutic activity. The flesh only of the apple was tested, the core and peel being rejected.

304. **Thornton, N. C.**

664.84/85:546.264

The effect of carbon dioxide on fruits and vegetables in storage.

Contrib. Boyce Thompson Institute, 1931, 3 : 219-44, bibl. 30.

The object of the investigation was to determine the range of safe CO₂ concentrations during storage. No attempt was made to determine the critical concentration of CO₂ for each fruit or vegetable, and the results are applicable to short periods of storage only. Twenty-two varieties were dealt with. In all tests except that of grape fruit increasing the temperature at any given concentration of carbon dioxide was found to increase the injury. The grape fruit was greatly injured by a high concentration of CO₂ at 0° and 4°C., but only slightly injured by the same concentration at 10° or 15°C. In three days strawberries held at 0°, 4° and 10°C. were greatly injured by 25 per cent. concentration. Delicious apple was only slightly injured in 7 days storage by 70 per cent. concentration at similar temperatures. Of citrus fruits held at temperatures varying from 0°-15°C. the range of injurious concentrations of CO₂ was 50 per cent. for grape fruit and tangerines, and 64 per cent. for oranges. The general effects of low concentration of CO₂ were retarded respiration, external colour changes, and in banana and peach noticeable chemical changes associated with ripening as also removal of the astringency found in green banana and pear. High concentrations of CO₂ impaired the flavour of all fruits, inhibited ripening, prevented changes in colour and flavour and caused external and internal discoloration. In general the percentage of CO₂ necessary to cause injury is related directly to the firmness of the plant tissue and inversely to the amount of moisture on its surface. For rapidly respiring materials the oxygen content of the atmosphere may be the controlling factor in so called carbon dioxide injury.

305. **Meirion Thomas.** 664.85.11:632.1:581.192

The production of ethyl alcohol and acetaldehyde by apples in relation to the injuries occurring in storage. I—Injuries to apples occurring in the absence of oxygen and in certain mixtures of carbon dioxide and oxygen.

Ann. Appl. Biol., 1929, **16** : 444-57, bibl. 8.

Ethyl alcohol and acetaldehyde are formed in Newton Wonder apples stored under anaerobic conditions by anaerobic zymasis, and under the influence of certain mixtures of carbon dioxide and oxygen by CO_2 zymasis. Both are lethal processes, especially the latter. The poisoning of apples by the products of zymasis is examined in detail. In gas mixtures containing carbon dioxide and oxygen, if the concentration of CO_2 is $< 13\%$ and that of O_2 subnormal, analysis of several varieties of apples indicates that zymasis does not occur. In gas mixtures where CO_2 concentration is $> 13\%$ and $< 20\%$, brown heart sometimes occurs. Experiments are planned to determine the relationship between brown heart and zymasis. A future possibility is suggested of diagnosing invasive alcohol poisoning and internal and invasive aldehyde poisoning by determining the ethyl alcohol and acetaldehyde content of suspect apples. The finding of these would point to improper ventilation of ships, holds or stores.

306. **Meirion Thomas.** 664.85.11/13:632.1:581.192

The production of ethyl alcohol and acetaldehyde by fruits in relation to the injuries occurring in storage. II—Injuries to apples and pears occurring in the presence of oxygen and in the absence of accumulations of carbon dioxide in the storage atmosphere.

Ann. Appl. Biol., 1931, **18** : 60-74, bibl. 19.

Among other conclusions reached by the author as a result of his continued experiments are :—

1. Ethyl alcohol and acetaldehyde do not accumulate in apples or pears stored in air so long as the fruit remains "physiologically healthy." 2. (a) Apples stored in air are liable, especially at low temperatures, but higher than 0°C ., to suffer from "low temperature internal breakdown" and from "soft or deep scald." After incidence of these, and as they become more profound, ethyl alcohol and acetaldehyde progressively accumulate in the unhealthy tissues. (b) The view is advanced that for some biophysical or biochemical reason, not as yet known, cells become unhealthy and zymasis follows subsequently as a secondary phenomenon. It is suggested that zymasis may follow many types of tissue injury. (c) Chemical analysis will often distinguish internal breakdown and soft or deep scald from invasive aldehyde and invasive alcohol poisoning. The differences between deep scald and invasive poisoning are particularly important, and it is urged that "scald" should only be used for invasive diseases which occur, independently of CO_2 accumulation, in air stores above 0°C . The disease known as superficial scald is not necessarily preceded by zymasis in the whole apple which is suffering from it. The author discusses two interpretations of the cause of zymasis.

307. **Neller, J. R.** 664.85.11-2.1:577.158.7

Relation of catalase activity to physiological breakdown in Jonathan apples.

Plant Physiol., 1931, **6** : 347-54, bibl. 12.

A convenient type of apparatus for catalase determination is described and a standard method of procedure outlined. It was found that the catalase activity tended to be higher in apples going through the breakdown process and to be decreased, below that of normal fruits, in apples in an advanced stage of breakdown. Catalase activity in apples not developing breakdown increased during the earlier and decreased during the later periods of storage corresponding to the youth and senescence of the apples. The theory that catalase activity measurements may be used as an index of metabolic activity is thus corroborated. The opinion is expressed that physiological breakdown of apples is associated with or caused by an accelerated metabolic rate. In this case a search for the cause might well include a study of physiological balance with regard to the food supply of the tree and its fruits. It is possible that more attention should be given to pruning and thinning operations to ensure an optimum fruit load.

308. **Hartman, H.** 664.85.13:632.1

A preliminary report on Anjou scald and its control.

Oregon State Agr. Coll. Agr. Exp. Sta. bull. 280, 1931, pp. 8.

Anjou scald does not materially affect eating quality but detracts considerably from the appearance of the fruit. It would appear to be quite distinct from common pear scald. It was found possible to control it effectively by the use of oiled wraps. The author's experiments suggest the feasibility of using a combination oil-copper wrap for the control of both botrytis and Anjou scald.

309. **Hartman, H.** 664.85.13.037:632.1

A peculiar freezing trouble of pears in cold storage.

Oregon State Agr. Coll. Agr. Exp. Sta. bull. 282, 1931, pp. 8.

The affected pears have a glassy, waterlogged appearance, and are inedible. The trouble is obviously physiological. It was produced experimentally by the author by long continual freezing in storage, at temperatures slightly below the freezing point of pears. He considers that such freezing may well be the cause of the trouble.

310. **Wiegand, E. H.** 664.85.7.037

The "Frozen-Pack" method of preserving berries.

Oregon State Agr. Coll. Agr. Exp. Sta. bull. 278, 1931, pp. 42, bibl. 7.

The author presents the results of trials of containers and pre-freezing treatments. Among his recommendations are:—Improved and standardized methods of packing—quick packing of fruit after picking, use of vacuum closed containers, choice of proper varieties, use of the fine granulated manufacturer's grade sugar with a ratio of 3:1. The syrup densities recommended are:—for strawberries and loganberries 60 to 70° Balling, red raspberries 60°B., blackberries 50-60°B., higher densities detracting from the flavour. Pre-cooling retards mould growth and shrinkage. It is done by washing with cold water, by allowing filled cans to pass through a box kept at a very low temperature, by addition of syrup at a low temperature. The use of cold storage at 30-31°F. immediately before freezing ensures the necessary syrup penetration. Freezing temperatures may range from -10°F. to +10°F.

311. **Eckart, T. G. and Cruess, W. V.** 664.85.774.037

Freezing storage of pineapple products.

Fruit Products J., 1931, 10 : 364-6, bibl. 5.

The writers believe that there are excellent opportunities in "frozen-pack" pineapple products, particularly the juice, crushed pineapple and a punch syrup made up principally of pineapple, orange and lemon juices. The juice does not darken during any stage of preparation nor when thawed for use, giving it a marked advantage over peaches, pears and certain other fruits. The flavour is retained perfectly provided the product does not come in contact with exterior odours. The digestive ferment bromelin, a constituent of pineapple juice was not noticeably affected by freezing. The taste of the frozen pineapple products is considered to be superior to that of pineapple preserved by heat.

312. **Benton, R. J.** 664.85.3:632.3/4

Prevention of decay in oranges.

Agr. Gaz. New South Wales, 1931, 42 : 411-3.

A trial of the treatment of oranges with borax and other agents as preventives of decay with a view to storing from November till the following February. One hundred and eighty-five bushels of oranges from eight growers were treated, about half the fruit being mountain grown. The two treatments chosen were (1) dipping in 8 per cent. borax solution heated to 110°F. for 4 minutes, and then painting with liquid paraffin. (2) Dipping in 3 per cent. bicarbonate

of soda solution similarly heated, and painting with paraffin. The fruit was then packed and cold stored. Borax proved the more efficient preventive of decay, the percentages of fruit decayed being after borax treatment 3.44, sodium bicarbonate 4.61, no treatment 9.51. The treated oranges also had a better appearance. Of 185 bushels received 22 bushels were lost by decay, the loss of the mountain grown fruit amounting to 7.17 per cent. as against 11.82 per cent. of the lowland grown.

313. **Hartshorn, R.**

634.771-1.547.6:547.314.2

Some effects of acetylene on the ripening processes of bananas.

Plant Physiol., 1931, 6 : 467-84, bibl. 40.

The investigations were made with normal and chilled green bananas of the Gros Michel variety. It was found that "carbide treatment" hastens the ripening processes of thoroughly green bananas as shown by the rates of softening, respiration, starch hydrolysis, flavour and colour changes, these effects being due to acetylene rather than to ammonia or other impurity in the gas. The maximum respiratory rate during ripening is not greatly altered by the treatment except in the case of severely chilled fruit, where it results mainly in the abbreviation of the period of low activity normally occurring at the beginning of the ripening processes. The condition of the fruit is of primary importance. It is suggested that the high initial respiratory rates determined by previous workers were due to the fruit being well advanced in maturation at the beginning of the experiment. The results with acetylene were in agreement with those obtained with ethylene and also with its previously determined effects on horticultural material.

PACKING, PROCESSING, FRUIT PRODUCTS.*314. **Sen, H. D.**

634.651-1.556.8

A study on the extraction of papain, the active digestive principle from papaya.

J. Agr. Sci., 1931, 21 : 209-19, bibl. 2.

The experiments were on the fruits of seedling trees of three different varieties, the soil conditions being approximately the same. Conclusions based on 448 fruits from 5 trees of the Cawnpore variety, 283 fruits from 2 trees of the Bombay variety and 82 fruits from one tree of the Calcutta variety may be summarized thus :—1. The first exudation of the juice gives the largest yield and best quality of papain. The yield gradually dwindles to nil. 2. The method of 4 lancements at a time gives the highest yield and does not exhaust the fruit quickly. 3. Maximum yield is got when the fruit is full grown but not ripe, the ideal tapping time. 4. Plucked fruits exude no papain. 5. The best fruit and highest yield of papain came from the Bombay variety, the Cawnpore being slightly inferior. The Calcutta is the worst as regards papain yielding capacity. Manurial trials with the Cawnpore variety on plots averaging 14 trees, but not duplicated, suggest the very disastrous effect of potash starvation on the papain yield, superphosphate starvation not being so marked.

315. **Anon.**

633.74-1.56

Improvements in the preparation of cacao beans.

Food Manufacture, 1931, 6 : 233-5.

This is the first published account of the new system of preparation of cacao beans originated by Dr. Alfred Laessig. He states that the normal washing and drying processes are both faulty and inadequate. To remedy this a washing plant of an entirely new design has been constructed by the firm of Wilh. Jaeger. It introduces two new functions, (1) an acceleration

* See also 299.

of the oxidation process by means of a thorough aeration, (2) a preliminary drying of the beans, which considerably shortens the final drying operation. As a result of this process oxidation is considerably promoted, and the beans being properly cleansed have their pores opened and freed from extraneous matter, thus permitting free penetration of oxygen and enhancing their flavour and aroma. The washed beans are subsequently passed through a new type of dryer, the "Wilha," which ensures a uniform and thorough drying while preserving the aroma producing enzymes. The output with beans of 28 per cent. moisture content is 2,500 kg. per eight hour day. Sectional drawings are given of both washing and drying machines. He claims that his method obviates the danger of spoiling the aroma by carbonized debris, and further ensures an easy separation of the shell from the nib in the cracking machines without destruction of the enzymes as in the old roasting method. It is held that the employment of this system leads to the production without increase of working costs of a purer, more palatable and more aromatic cocoa and that better qualities of cocoa can be made from the cheap-grades of raw materials. Valuation by experts of samples prepared in both ways would appear to support this claim.

316. **de Villiers, F. J.** 634.3:668.526.4
Citrus by-products. Orange and lemon seeds.
Farming in S. Africa, 1931, 6 : 132.

Orange and lemon seeds obtained from an orange squash manufacturing firm were analysed. The oil extracted is a clear light yellow oil, semi-drying and resembling cotton seed and many other common vegetable oils. It may be useful for soap making and it may possibly be suitable for replacing raisin seed oil in rubber-making. The seed cake formed after extraction has been found in America an excellent cow feed. Analysis figures are given. The possibility of using these waste products is discussed.

BOOK NOTES.

317. **Kobel, F.** 634.1/2:581.1
Lehrbuch des Obstbaus auf physiologischer Grundlage. (Textbook of Fruit-growing—from a physiological standpoint), 1931. Julius Springer, Berlin, R.M. 18.40, pp. 274.

This work is primarily for the research worker or the grower determined to keep abreast of the teachings of modern research and the reasons, largely physiological, on which that teaching is based. Not only is a bibliography included extending to some thirteen pages devoted to articles on modern research on pome and stone fruits carried out in Europe, Soviet Russia and North America, but a serious attempt is made by the author to correlate the different results of various authorities on particular subjects. He reproduces the tables and often, very excellently, the illustrations of the above articles, giving also a considerable number of original figures from his own work, to make his points clear. Keeping strictly to his physiological standpoint he deals with the practice and science of fruit growing under the following headings:—The physiology of fruit trees—general; blossom formation; fruit formation; the relationship between vegetative growth, blossoming and fruit formation; breeding new varieties. A most interesting section is devoted to the thorny question of the carbohydrate-nitrogen ratio and its relation to blossom formation, considerable attention being paid to the reconciliation of Potter and Phillips' results with those obtained by other workers. He comes to the following conclusions:—A minimum carbohydrate content is necessary for blossom formation. There is no proof that the overstepping of a definite carbohydrate content implies the overstepping of an optimum. A minimum nitrogen content is essential. Increasing

the nitrogen content at first causes increased blossom formation, but continued increase eventually causes it to fall off. It would appear that a definite carbohydrate:nitrogen ratio must be reached before blossoming can take place: moreover no blossoming will take place even given this ratio unless nitrogen and carbohydrates are present in adequate quantity. Given this ratio, we have no reason to suppose that a falling off in blossom formation will ever occur, whatever the amounts of these constituents above the minimum. Increased blossom formation would therefore continue up to the limit of capacity for carbohydrates and nitrogen. He considers that Hooker and Nightingale are correct in advocating the separation of the starch from the carbohydrates and the insoluble nitrogen from the nitrogen in future work, as these would seem to be the best measure of the reserve substances available for the process of blossom formation. He also suggests that other ratios, such as the carbohydrate:potassium or carbohydrate:phosphorus ratio may equally be worth the attention of research. Throughout the book in all its various sections the author gives a dispassionate account of modern research results on particular points. Considerable attention is paid to the rootstock work at East Malling and its tremendous possibilities. Taken as a whole the book should prove a most valuable reference work to the research worker on pomology for many years to come.

318. **Ritter, K. and Schubring, W.** 634/5(73):338:658.8
 Produktion u. Aussenhandel der Vereinigten Staaten von Amerika an
 Gartenbauerzeugnissen. (The production and foreign trade in horticultural
 produce of the United States.)
Berichte über Landwirtschaft, Neue Folge, Sonderheft 29, 1931, Paul Parey,
 Berlin, R.M. 18, pp. 246.

This carefully tabulated work gives not only information on the amounts and values of imports and exports in recent years up to 1929 of all important fruits and vegetables and other such horticultural produce as seeds, cut flowers, nursery stocks, etc., but also a clear insight into the marketing organization. Maps are given which show diagrammatically the route followed by fruit and vegetables from grower to consumer in the United States. Particular attention is drawn to the methods of handling adopted, details of wrapping, grading and packing being given and illustrated, while the advantages of thus getting uniformity in the final products are stressed. Production figures include data on place of origin, plants in bearing and not yet in bearing and actual crop production, the latest figures in nearly every case being those for 1929. An interesting feature of the section on imports is that one can see by a glance at the tables the varying importance of different importing countries as regards any particular commodity. General notes are given on American nursery practice, and it is observed that the American fruitgrower normally buys his trees from the nurseryman one year after working, or at most two years. Nurseries are subject to State supervision. The facilities for studying horticulture at school and in the University are favourably remarked, as also the extension work of the county agent backed by the authority of the State Experiment Stations. The work of the Department of Agriculture at Washington is discussed, though no mention is made of the Bureau of Plant Industry, the horticultural section of which has done and is doing so much to thresh out thorny horticultural problems, whose solution lies outside the scope of the ordinary State Experiment Station and beyond the means of the private individual. The main concern of this work is, however, primarily with production and distribution and with the methods used to ensure the delivery of horticultural produce in proper condition to the consumer. The United States, happily free from the fettering traditions of European countries, has shown how such problems may be solved. The writers do not suggest slavish imitation, but they do consider that a study of methods adopted in the U.S.A. may be of great use to others confronted with similar problems. An account of the different methods of treating different fruits and vegetables is given and some hundred illustrations of packing, grading and a multitude of other horticultural operations bring the work to an end.

319. Empire Marketing Board.**634.1/8:382.5**

Fruit Supplies in 1930.

Empire Marketing Board Memorandum 38, 1931, pp. 113.

Statistical data on :—Fruit consumption in the United Kingdom, imports of the more important fruits, fruit pulp, onions, potatoes, tomatoes, fresh vegetables, flowers, bulbs ; the North American apple season 1929-30, the S. African deciduous fruit season 1929-30 and the Australian and New Zealand apple season 1930 ; the summer orange season 1930. Finally particulars are given of fruit imports into Germany, Sweden, Norway and Denmark since 1925.

320. Washington State Horticultural Association.**634/5(79.7)***Proceedings of the 26th Annual Meeting, December, 1930, pp. 248.*

The papers given deal among other things with the following subjects :—Sprinkler versus furrow systems of irrigation—codling moth control methods—apple tree roots—the horticultural research programme of the Agricultural Experiment Station, State College of Washington—apple varieties, qualities and economics. The report of the 21st Annual Meeting of the Western Washington Horticultural Association is also included. Without going into actual experimental detail the speakers give a very good idea of the more important work at present being undertaken in the State of Washington.

321. Wye.**63(072)(05)***Journal of the South-Eastern Agricultural College, Wye, Kent, 1931, No. 28, pp. 313.*

This issue contains among articles of general agricultural interest the following of horticultural interest :—Identification of commercial species of pea and bean seeds.—Hops.—An unusual form of hop canker.—Some observations on winter moth caterpillar attack on fruit trees in 1929-30.—A note on the strawberry and raspberry bud weevil (*Anthonomus rubi*).—A contribution to the biology of the apple capsid (*Plesiocoris rugicollis*) and the common green capsid (*Lygus pabulinus*).—Observations on gall midges affecting fruit trees.—Notes on the outbreak of the cabbage aphid (*Brevicoryne brassicae*).—The control of apple scab: I—Bramley's seedling; II—Allington Pippin and Newton Wonder.—A blossom wilt of lavender caused by *Botrytis cinerea*.—The preparation of oil sprays.—Insect visitors to fruit blossoms.

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